28 SEPTEMBER 1956

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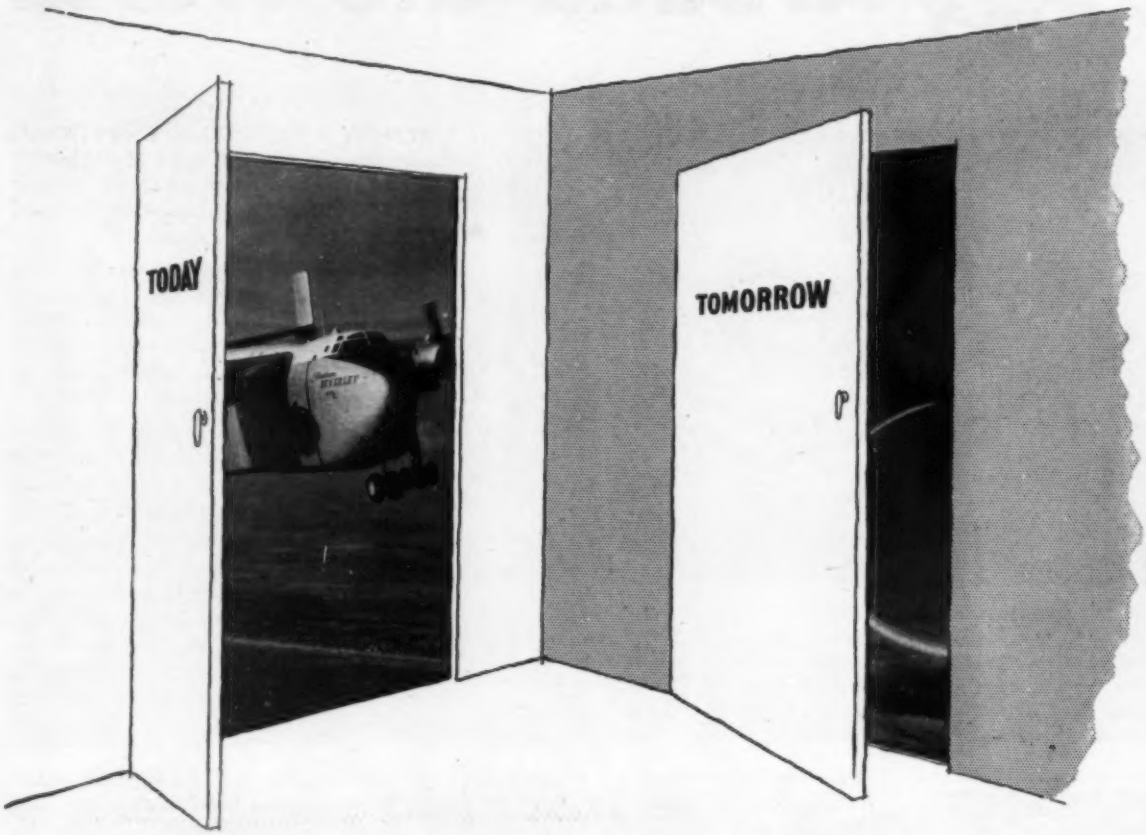

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A77/a

Around the World

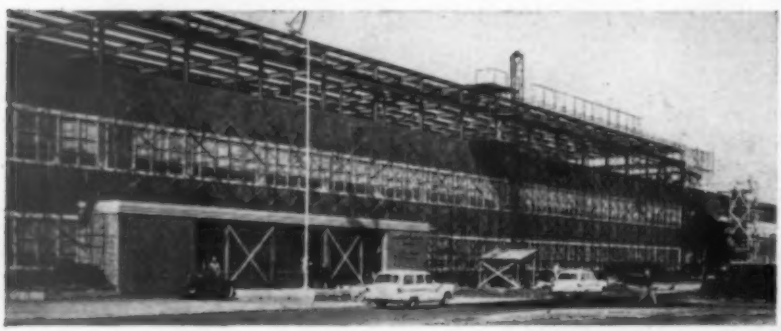
PRATT & WHITNEY AIRCRAFT division is expanding its branch plant at North Haven, pictured above, to a million square feet. Production for big turbojet engines is the principal activity here, as well as at the much larger Pratt & Whitney factory in East Hartford. This division builds turbojets, turboprop and piston engines, powering many different types of aircraft, both military and commercial.

ALMOST $213,000,000 of United Aircraft Corporation's own funds, spent in the last 10 years, stand behind the advanced aviation products—and those yet to come—manufactured by the Corporation's three divisions.

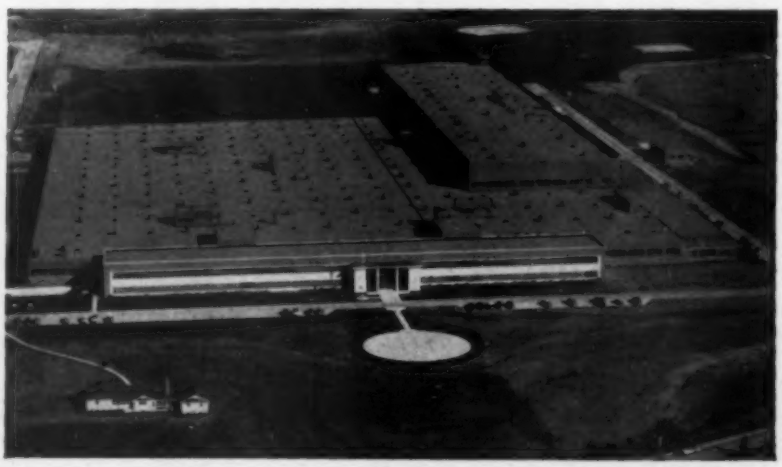
This unprecedented expenditure has been invested in construction of new experimental facilities and factory space, all in Connecticut. When complete, space will total 10,768,000 square feet, or about 250 acres, nearly three times as much area as was used in 1946.

Three new plants are pictured here. These are at North Haven, Windsor Locks, and Stratford. Large additions are being built at two of these plants to handle increased production.

Of the total, $80,600,000 were spent for research and experimental facilities, tools, and equipment. Included are the huge Willgoos Gas Turbine Laboratory, extensive laboratories at Hamilton Standard, and other installations necessary to assure continuing leadership in the power plant, propeller, equipment and helicopter fields.



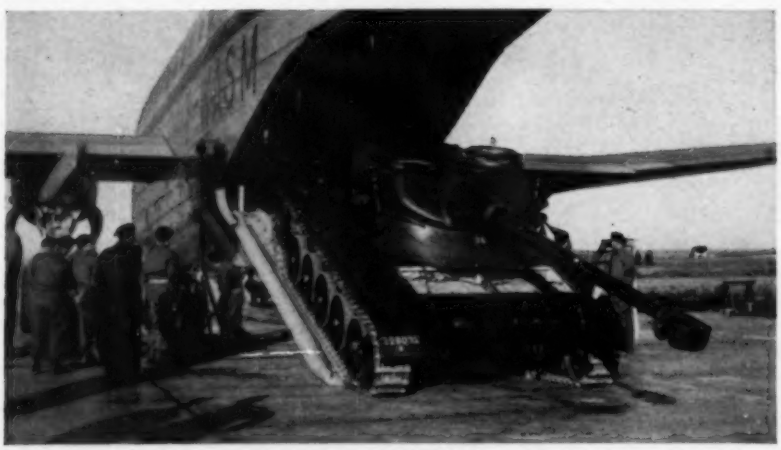
HAMILTON STANDARD division opened its new plant at Windsor Locks in 1952. Today, increasing propeller and jet equipment business requires additions totaling 400,000 square feet, part of which are shown here. The plant has extensive research facilities and a large branch at nearby Broad Brook.



SIKORSKY AIRCRAFT opened this huge new Stratford factory last year to handle production of S-55 and S-56 helicopters. Another plant in Bridgeport produces S-58 types. Facilities such as these help Sikorsky maintain its position as the world's foremost designer and manufacturer of helicopters.

with United Aircraft

CAA CERTIFIES S-58—Sikorsky Aircraft's big 12-passenger S-58 has been certified for commercial use by the Civil Aeronautics Administration, U.S. agency governing civil aviation. New York Airways, which operates helicopter mail, passenger and freight service, is the first commercial user to take delivery. The S-58 will carry a 2-ton payload 100 nautical miles, cruising at 100 m.p.h. It achieves the lowest ton/mile cost in helicopter history. A U.S. Army version of the S-58, an H-34, on July 12 set three closed course speed records for 100, 500 and 1000 kilometers. Record speeds, subject to confirmation by the Federation Aeronautique Internationale, are 141.9 m.p.h. for 100 kilometers, 136 m.p.h. for 500 kilometers and 132.6 m.p.h. for 1000 kilometers—all substantially higher than prior records.



PROPELLERS FOR BREGUET 765—Hamilton Standard Hydromatic propellers have been selected for a fleet of Pratt & Whitney-powered Breguet 765 transports being built for the French Air Force. Blades are solid aluminum. The propellers, 16 feet in diameter, will have feathering and reversing features, fluid deicing and synchronizing. The Breguet 765, and 39 other basic types of civil and military aircraft, fly throughout the world with Hamilton Standard propellers.

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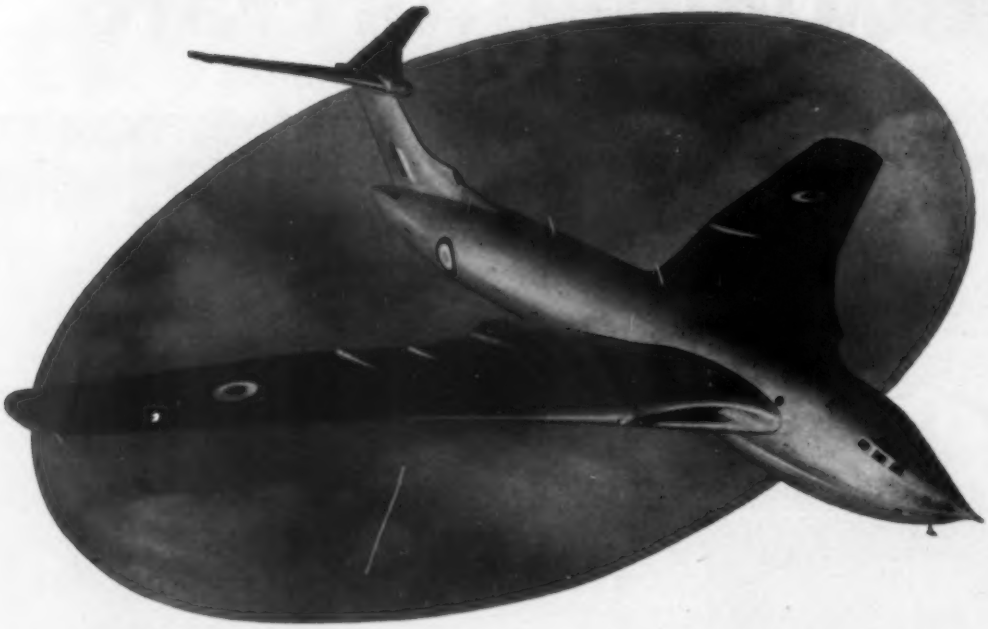

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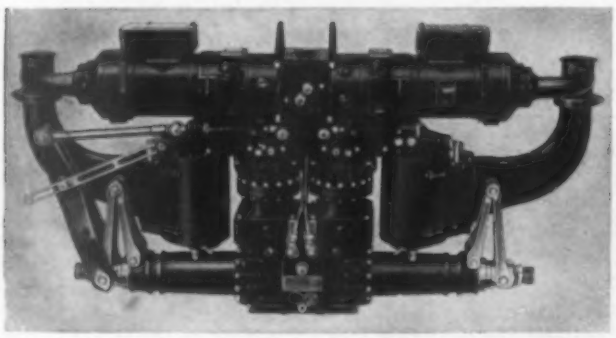

HOBSON POWER FLYING CONTROLS are now being specified for a number of British aircraft including those incorporating "All flying" or "Slab" tailplanes.

The unit, as illustrated, is a self-contained duplicated electro-hydraulic screwjack type for operation of port or starboard ailerons.

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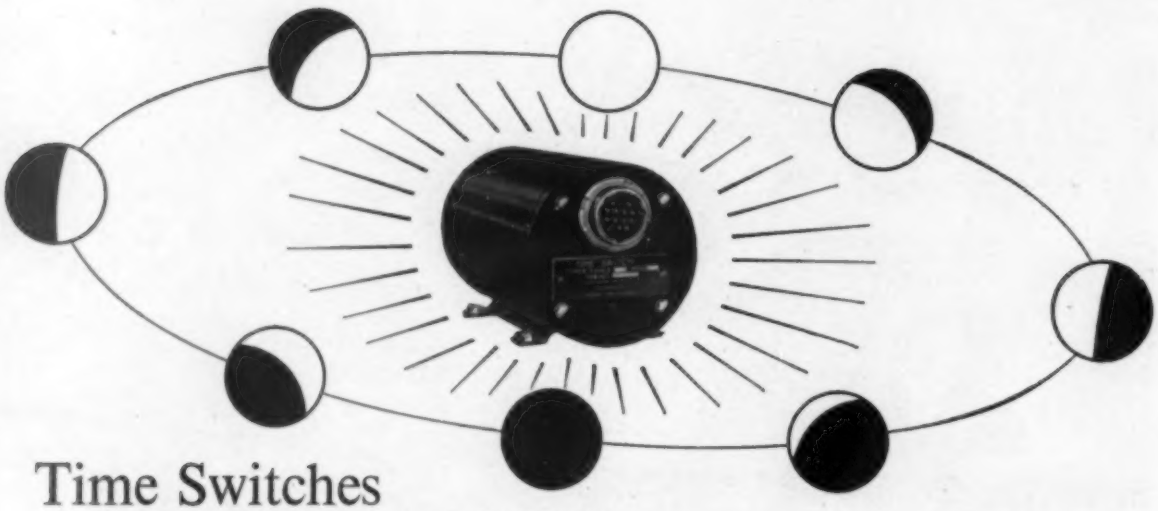

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night flight to Barcelona

(Photo by courtesy of British European Airways)

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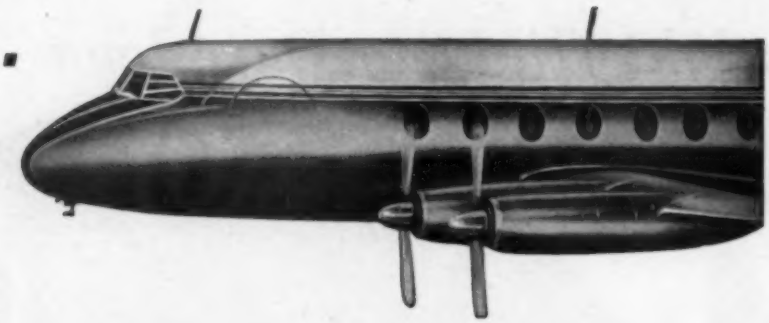

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164

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Avro Vulcan

NOW IN SERVICE WITH THE R.A.F.

The Avro Vulcan, the world's first 4-jet delta bomber has entered the Royal Air Force.
Behind the recent Air Ministry announcement lies a brilliant chapter of aeronautical progress that marks the beginning of a new era in Britain's air power.
With its near sonic speed, its great range and altitude and its large carrying capacity, the Vulcan, powered by four Bristol Olympus turbo-jets, is a formidable aircraft.
Add to this its fighter-like manœuvrability, exceptional safety and pleasant handling characteristics and you have the reasons why the Vulcan is the most effective bomber in service today.
But that is not all. The Vulcan has a great development potential.
It has been engineered to allow for new operational requirements which can be met without major alteration to the basic design.
In the tough testing ground of the R.A.F., on routine exercises and on long-range training flights, the Vulcan has already shown its paces.
Its recent trans-world flight to Australia and New Zealand has earned it the highest praise. Like its illustrious predecessors from the Avro stable — the Lincoln, the Lancaster, the Anson, the 504 and many others — the Vulcan is destined to become one of the world's really great aircraft.

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FIRST AERONAUTICAL WEEKLY IN THE WORLD FOUNDED 1909

FLIGHT
and
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Icy Blast

TO aviation's rich vocabulary of bogy-words has been added another, or rather two others. They are dry ice. The physics of dry ice are still partly empirical, but two facts about it at least are clearly understood. One is that it occurs in over-generous quantities, particularly at the 20,000ft tropical freezing-level through which B.O.A.C.'s Britannias have been cruising on their proving flights. The other is that it manifests itself as particles varying in size from micron-small crystals to golf-ball-like hailstones which, in the core of a thunderhead, can confer upon parts of an aeroplane the finish of a beaten-pewter pot.

But for those micron-small crystals the Britannia and its Proteus engines would have been carrying passengers some nine months ago. But last October, while ice-hunting in Africa to clear final airframe certification, a Britannia experienced sudden engine flame-outs. The trouble was specially mysterious, because the Proteus and its installation had undergone intensive icing tests a couple of years before, and had passed them with full marks.

The story of what followed the African tests has yet to be told. The many chapters will recount week upon week of spray-rig trials with the Proteus-Ambassador, during which thousands of gallons of supercooled water-droplets were sprayed into the engine, encrusting it with ice which was consumed without difficulty; the precautionary curtailment last April of B.O.A.C. proving flights; the series of tests in Africa with a fully instrumented Britannia equipped with a television camera in a critical area of the engine cowling; the prolonged and deliberate flying by Bristol and B.O.A.C. crews in the savage hearts of African cu-nims; the installation of automatic engine-relighting equipment; the resumption in August of B.O.A.C. proving flights; and the recent decision to postpone passenger services for yet a further period.

There are those who feel that Britannias could be operated now with complete safety until the "remedial measures" are completed; and, it might be argued, even if flying in dry-ice conditions could not be avoided by a temporary change of course or of height, the new automatic re-lighting system could prevent loss of power. And (it could be further argued) in the event of a flame-out, manual re-lighting would restore power.

But those in positions of the highest responsibility feel that passenger services cannot start while there is the million-to-one possibility of complete loss of power; and no one could reasonably contest this argument. Nevertheless, the decision to postpone passenger services should not go on record without a tribute to B.O.A.C. and to Bristol—both of whom have so very much staked on the aircraft—for their inflexible and unhesitating sense of responsibility to the public.

It would, we feel, be dangerously complacent to imagine that dry ice can affect only the Proteus powerplant. It is to be hoped that other turbine manufacturers will now make doubly sure that the two words can never spell trouble so far as their own engines are concerned.

Fighters and Bombers

CORRESPONDENTS attending the Fighter Command briefing for Exercise Stronghold (page 547) were rewarded by some straight talking by the Commander-in-Chief. "Very disappointed" were the R.A.F., he said, by Hunter and Javelin delays. But, unlike some other forthright talkers who come to mind, the C-in-C. proved himself a straight and fair thinker also, adding that the "awfully bad name" that the Javelin was tending to get was "rather unjust." More heartening still was his assurance that the P.1 would eventually be capable of about Mach 2, and that Fighter Command was now thinking in terms of Mach 2-3.

The C-in-C. must, we believe, set his sights for the higher limit. Only last week we wrote of a bomber which might itself attain Mach 2; this week we record the ordering of two others which promise a yet more spectacular performance.

FROM ALL QUARTERS

Flight of the Royal Heron

A FEATURE of Princess Margaret's five-week tour of East Africa, Mauritius and Zanzibar is the extensive use which she will make of air transport. Her Royal Highness, who left London Airport on September 21, journeyed to Africa in Argonaut G-ALHD flown by Captain Houider of B.O.A.C., and most of her travel over the rugged terrain of East Africa will be made in the royal D.H. Heron.

The planning and safety precautions for these trips are complicated operations that have been entrusted to Cdr. Stacey W. D. Colls, East Africa's Director of Civil Aviation The Directorate will be able to draw on the experience that they gained during the Queen's visits to Kenya and to Uganda, but the greater extent of the current royal tour will present additional problems associated with the co-ordination of normal services and with the thirteen special aircraft that will be used.

A preliminary operation carried out before the tour was to check the suitability of the airfields on the route; an inspection that revealed the necessity of widening and lengthening Sao Hill (in South West Tanganyika) and improving Nimmo's in Kenya (on the Kinangop). The usual U.K. royal flight procedure of establishing a purple airway—completely closed to all other flights—has been followed and the various operators affected have been warned. The problems of insufficient radio beacon coverage have been solved by arranging for portable beacons to be sited along the route; one non-directional beacon is being taken 450 miles to Sao Hill and then Amboseli on an R.A.F. lorry and another has been specially made up to be carried on a trailer to Nimmo's and then on to Nakuru.

During the flights, additional safety precautions will be taken. The Heron's co-pilot will be the senior superintendent commanding the Police Air Wing, W/C. Francombe, who has extensive local knowledge; and Cdr. Stacey Colls, accompanied by an air traffic control officer, will use a Pembroke to precede the Heron to each destination airfield.

Sabres for Israel

ON Friday last, September 21, the Canadian Government announced that it had approved the sale to Israel of 24 F-86s. Mr. St. Laurent, the Prime Minister, said that after consultation with "certain friendly Governments," the Canadian Government had decided it would not be justified in refusing the request made some time ago by the Israel Government for the purchase of these aircraft.

The Canadian Government had been greatly influenced in its decision "by the fact that Israel's neighbour has recently received large numbers of jet fighters from the Soviet Union and, even more important, a considerable number of modern jet bombers, of which Israel possesses none. Assurances have been received from Israel that the intercepters in question will be used solely for defence against aggression."

Mr. St. Laurent added that approval for the F-86s covers a period of six months, during which time the aircraft would normally be made available and shipped. If at any time during that period the political circumstances should change in such a way as to warrant cancellation or postponement of the outstanding part of the order, such action would be taken.

Reported, but Unconfirmed

IT is reported from America that the Lockheed F-104A has now been flown considerably faster than its "best operational speed of Mach 2.5"; and that the engine compressor suffered damage as a result. Flying at an unstated altitude, the aircraft apparently exceeded Mach 2.8.

Officially unconfirmed but reliable reports also have it that a Bell X-2, piloted by Capt. Kincheloe, reached a height of 126,000ft this month, thus setting an unofficial altitude record for air-launched aircraft. The X-2 already holds the unofficial speed record of about 1,900 m.p.h.

After the Hustler

FOLLOWING our design-analysis of the Convair Hustler supersonic bomber in the preceding issue, and our editorial comment on supersonic bombers generally, comes news of two new American machines of this class (though probably smaller). The first is the North American A3J, a carrier-based machine for the U.S. Navy. Subject of an $86 million contract for research, development and production, it will be capable of more than 1,000 m.p.h., will have two turbojets and will carry a crew of two. Doubtless it is intended as a replacement for the Douglas A3D Skywarrior.

The second machine is a Glenn L. Martin land-based tactical bomber, designated XB-68, for the U.S.A.F. An American report states that this will be made of stainless steel and will be capable of Mach 2. A range of between 2,000 and 3,000 miles and a ceiling approaching 100,000ft are mentioned.

Lost Parliamentary Seats

A COURT of inquiry is being held into an incident involving injury to several M.P.s last Monday, when a Transport Command Valetta in which they were returning to Northolt after a visit to the 2nd T.A.F. in Germany went into a sudden dive from 6,000ft at a point between Chatham and Maidstone.

According to statements by some of the M.P.s after landing, they were flung upward from their seats and struck their heads on the roof. Mr. Frank Beswick (Lab., Uxbridge), a former Parliamentary Secretary to the Ministry of Civil Aviation, and Mr. Geoffrey de Freitas (Lab., Lincoln), a former Under-Secretary for Air, were detained in hospital.

The aircraft, from No. 30 Squadron, apparently lost about 400ft before the captain (F/L. D. Lawrenson) and co-pilot regained control. The mishap has been unofficially attributed to a "violent air-pocket" and/or sudden failure of the automatic pilot.

T.R.3 Triumphs

THE Royal Aero Club lost its £50 wager with the British Automobile Racing Club that an aeroplane flying from Land's End to Elstree *via* John o' Groats would use less petrol than a car travelling between the same points.

In a contest to decide the issue, a Triumph T.R.3, driven by Lord Selsdon and Lord Essendon, used 36.6 gal of petrol over a distance of 1,573.1 miles, giving a consumption figure of 43 m.p.g.; while the Auster J.4 flown by Mr. Harold Best-Devereux, with Mr. Geoffrey Sykes as passenger, used 61 gal in flying 1,362

NEW ACQUAINTANCE, OLD FRIEND: Citizens of Sydney (below, left) take a first look at the Avro Vulcan at the city's airport; and, on right, Air Marshal Sir Harry Broadhurst, A.O.C. Bomber Command, who flew to Australia in the Vulcan, meets an old friend in Melbourne —Air Marshal Sir John McCauley, now Chief of the Air Staff, R.A.A.F., who was Air Staff Officer in Sir Harry's Group in France, 1944-45.

HIGH-ALTITUDE PHOTOGRAPHER: This new air-to-air picture of the English Electric P.R.9 clearly shows the modified plan-form, which includes a further rearward extension of the "floating" trailing-edge of the centre-section (wing span is increased by 4ft to 68ft). Among details which can be identified are numerous small camera ports both fore and aft of the bomb-bay. The bay, apparently, is now in two sections, the rear section of which opens.

miles, an average of 22.3 m.p.g. Estimated distance for the aircraft (*via* Cardiff and Perth and back *via* Perth to Elstree) was 1,181 miles, but bad weather increased this by 181 miles.

"Although the wager was lost by a very handsome margin," said an R.Ae.C. statement afterwards, "the Royal Aero Club is particularly pleased to be able to demonstrate that in very bad weather conditions a private aeroplane can fly at an average petrol consumption of 22.3 m.p.g. against headwinds."

The prize money was handed over to the winners at Goodwood on Saturday last.

Space-flight Year Minus Two?

AT the closing session of the International Astronautical Congress, held in Rome from September 18 to 22, Dr. L. R. Shepherd, of the Atomic Energy Research Establishment, Harwell, was elected president of the International Astronautical Federation for the coming year. The outgoing president, Mr. F. C. Durant of the United States, was elected to a vice-presidency.

When the congress opened, Mr. Durant said, "This might be called the space-flight year minus one—or perhaps two." He described the launching of the earth satellites as "only the beginning" and added: "After this will come flights round the moon and before the end of the century we will have man landing on the moon."

During a discussion on the problems of weightlessness, Dr. S. J. Gerathewohl, of the U.S. School of Aviation Medicine, described experiments to produce it in the occupants of an aircraft for periods up to 45 seconds. A Lockheed T-33 was used, the same pilot flying it in experiments with 16 different passengers, who were in some cases held by harness and in others not. The aircraft was "made to follow a parabolic arc such as would be described by a stone flung by a giant to 20,000ft." But it could not be said whether the findings from such experiments would still apply if weightlessness were extended from seconds to minutes or days or even years.

FOLLAND PROMOTIONS: Mr. J. Boulger (left), assistant chief designer to Folland Aircraft since 1951, has been appointed deputy chief designer and Mr. Alan Constantine becomes assistant chief designer (development). Mr. F. J. Digby (right) is appointed assistant chief designer (research).

Airborne TV

THAT historic piece of Cambridge greensward called Parker's Piece, where Jack Hobbs learned to play his cricket, was the scene of an unusual activity on Thursday of last week; for from it Bristol's well-known Sycamore G-AMWI (now finished in B.E.A. colours, though without the Corporation's name) took off for a demonstration of aerial TV with Peter Wilson at the controls and John Downes, of Pye Telecommunications, Ltd., as camera operator.

What happened subsequently was more or less faithfully depicted on four screens in a lounge of the University Arms Hotel (which looks out on Parker's Piece), before a mixed audience of air attachés, Service and Police officers, B.B.C. and Home Office officials, and journalists.

As the Sycamore cruised over Cambridge at heights varying from 1,200ft to 200ft, the screens depicted a pictorial Baedeker summary of colleges and churches, plus traffic jams, the railway station and a train pulling out. In general the pictures were clear, though there was some interference, which may in part have come from the rotor blades; but such a periscopic view would certainly be helpful for police tracking criminals or controlling traffic, and perhaps have a limited military value.

The camera system used was a miniature Pye industrial unit, adapted to work from the aircraft 24-volt supply, and the Sycamore carried a new type of aerial, designed to avoid rotor-blade interference. All the airborne equipment required was carried on a stretcher behind the pilot, with the operator sitting beside him in a backward-facing seat. At present this equipment has a range of five miles and weighs 350 lb; but Pye are confident that they can increase the range to 100 miles and decrease the weight to about 150 lb.

Sudan Cotton-Spraying

ON Monday next, Austers and Tiger Moths belonging to Crop Culture (Aerial), Ltd., are due to begin spraying 50,000 acres of cotton in the Sudan. They will be operating under contract to the Sudan Gezira Board, which controls the national cotton-growing scheme, and the work is expected to involve 23 days' intensive flying. The aircraft are all equipped with Micronair rotary atomization equipment (described in *Flight* of March 23 this year), which gives close droplet control, and both D.D.T. and the new chemical Anderin will be used.

NEW SETTING FOR ILYUSHINS: A formation of Il-28 light bombers over Bilbeis—now an Air Academy, but well known to many ex-R.A.F. pilots as a Middle East conversion unit—during a graduation parade of Egyptian Air Force cadets. It was during this ceremony that Colonel Nasser delivered one of his attacks on the Western Powers.

Sports Flying in France

AIR TOURING COMPETITIONS

The concourse of aircraft and competitors in readiness for the Grand Prix de France. A number of the English aircraft are in evidence.

ON September 7 the competitions for the Grand Prix de France opened at Biarritz airfield, 34 aircraft (from England, Belgium, France, Holland, Denmark, Switzerland, Italy and Germany) taking part. Of these, seven were damaged during the first phase of take-off and landing trials, though nobody was injured, and the number of competitors was thus reduced to 27. Results of the landing and take-off competition were worked into the handicap formula for a race from Biarritz to Toulouse, a distance of 234 km (145.4 miles). The handicaps were fixed according to the following formula:—

$$V_h = 10\left(\frac{W}{W_u} - 1{\cdot}5\right) + \left(K_1 \times \sqrt[3]{\frac{100\,H}{S}} \times \left(\frac{D_1 + D_t + G}{2}\right) \times K_2\right)$$

where V_h = handicap speed in m/sec; W = certified total weight of the aircraft; W_u = certified useful load; H = engine power in horsepower (75 kg. m/sec); S = wing area in sq m; D_t = take-off distance in metres established in tests; D_l = landing distance in metres established during tests; G = penalty established by accelerometer reading at touch down; $K_1 = 1$ for aircraft with side-by-side seats and 1.25 for those with tandem seats; $K_2 = 1$ for single-engined aircraft and 0.85 for twins.

In addition, the all-up-weight figure in the handicap formula was favourably modified if competitors carried equipment increasing safety or comfort. The figure was reduced for such equipment on the following scale: battery, 12 kg; generator, 5 kg; starter, 7 kg; fire-extinguisher, 3 kg for each engine; hot-air supply, 4 kg; soundproofing, 4 kg; lighting, 2 kg; V.H.F. radio, 3 kg; I.L.S., 3 kg; a blind-flying panel including horizon, direction gyro, turn-and-slip indicator and V.S.I., 4 kg. In addition, the visibility from each aircraft was assessed by the judges and marked from 0 to 12, inversely proportional to its quality. 1 kg per point was then added to W in the formula, the worst visibility carrying a penalty of 12 kg.

Take-off and landing tests obliged the competitor to take off over a flagged string 1 m above the runway and to land over a similar string 3 m above a grass landing run. The distances achieved were measured by observers. Each competitor could attempt the landing and take-off tests twice. If he failed to clear the barriers twice during landing his landing distance would be reckoned as twice his measured take-off distance; similarly, failure to complete the take-off test successfully after two attempts would incur a take-off distance reckoned as three times his measured landing distance. Anyone who struck the obstacles on each of his four attempts would be totally disqualified.

Each aircraft had to carry fuel sufficient to complete both take-off and landing trials and the race to Toulouse without refuelling. In addition, each aircraft was loaded with pilot and passengers, and ballast if necessary, up to 50 per cent of the useful load figure specified in the C. of A.

In addition, landing distance was penalized by an increase according to the indications of an accelerometer attached to each aircraft. Thus 2.5g at touchdown brought a penalty of 37.5 per cent increase in reckoned landing distance and beyond 4g the aircraft was disqualified. Wind speed was taken into account.

For the speed trial each aircraft had to carry a full complement of passengers reckoned at not less than 60 kg weight each as well as baggage, the prescribed weight being made up with ballast in the absence of human passengers. Other stipulations were proper insurance coverage and that nobody should use fuel of an octane value exceeding 80.

The handicap formula was established by M. Jacques Fage of the French Aero Club and based on tests carried out in other countries in order to give an advantage to the best aircraft flown by the best pilot. In most other countries handicaps are established by a committee of experts, often with excellent results in terms of a close finish. Nevertheless, M. Fage's formula has the advantage of favouring aircraft on a technical basis, so not every pilot has an equal chance of the kind he might expect in England, where a Tiger Moth could race against, say, a Vampire with a fair prospect of success. Results of the Grand Prix de France show that M. Fage was on the right track in seeking to establish the real technical qualities of the aircraft.

Another method of making a technical assessment of the value of an aircraft might be to organize a race of 1,500 to 2,000 km without handicaps, classifying aircraft simply by engine cubic capacity. If in such a contest no allowance was made for refuelling stops, the fastest aircraft would not be those with the highest airspeed, but those which combined in best proportion their horizontal and climbing speed with their range. But the Grand Prix de France formula takes this into account, too, by measuring take-off and landing distances, which can often be identified with rate of climb. An aircraft with a short take-off is always significant, especially if this quality does not adversely affect speed and range.

The actual competitions confirmed that only the really modern and useful aircraft could assert itself. At Biarritz competitors were received by the local aero club and the Aéro Club de France. Monsieur Allés, the president, was present from the beginning and followed the various stages in his car. There also were Gen. Chassand Patron, secretary-general of the French Aero Club and Ingénieur Riffard, designer of the Caudrons-Rafales, and all worked unceasingly to make the event a success.

Landing and take-off tests occupied the time from morning to dusk on the first day, with Ing. Riffard and his wife officiating. It was during these trials that several aircraft were sufficiently damaged to put them out of the competition. On the following day the race to Toulouse was flown, and observed by timekeepers

The take-off and landing tests called for considerable skill and judgement and seven competitors were forced to retire after damaging their aircraft. At left, above, a French Army Piper PA.18 noses over on the runway and, below, Rosaspina in the Super Falco clears the take-off marker expertly.

from the Aéro Club de France. A well-known Dutch pilot, Mr. Burgerhout, in a Bonanza, gained a decisive victory, beating by a few seconds *Flight's* correspondent, Vico Rosaspina (and his passenger, Sig. Candioli) in an Aviamilano Super Falco F.8. The Super Falco gained the prize for covering the distance in the shortest time. It was followed by M. Querey, the well-known aircraft constructor, in a Jodel D.112. Other finishers, in order, were:—

M. Rébillon (France) Supercab; M. Mouza (France) Supercab; M. Goemans (Belgium) Tri-Pacer; M. Béda (France) Norécrin; M. Lalanne (France) Norécrin; M. Bonneau (France) Wassmer-Jodel; M. Lignel (France) Rondone F.4; M. Grandjean (France) Norécrin; Mme. Dormois (France) Minicab; M. Moucaud (France) Minicab; Herr Junius (Germany) Jodel; Mr. Lang (Holland) Ercoupe; M. Melun (France) Norécrin; M. Frantz (France) Piper PA.18; M. Blond (France) Ercoupe; M. Garnier (France) Norécrin; M. Fortier (France) Norécrin; Adj. Brisou (France) Cessna L-19 Bird Dog; Mr. Devries (Holland) Ercoupe; M. Tourtel (France) Jodel; Mr. Iles (England) Miles M.18; M. Perrier (France), Piper Supercruiser; Mr. Showell (England) Auster J.5; Mr. Byars (England) Miles Messenger.

With these events the Grand Prix de France was concluded and, on the same day, the test for the Coupe Touristique of the Aéro Club de France began. Participation in this contest was confined to those who had successfully completed the Grand Prix de France. The first trial was a time-of-arrival test after a flight from Toulouse to Carcassonne, which was won by M. Mouza, followed by Iles in the M.18.

On the following day there was a navigation trial in which pilots took off to fly to Cannes with sealed orders giving them three obligatory check points en route. Unfortunately fog forced exactly half the competitors to land at Bézier, short of Montpellier. Of the 27 who left Carcassonne, 12 (and Gen. Patron's aircraft) landed more than 300 km short of Cannes. M. Goemans in his Tri-Pacer proved his ability as a navigator by reaching Cannes despite the fog and identifying all his check points. This gained him first place in the Coupe Touristique; second was Mr. Lang (Holland) in his Ercoupe.

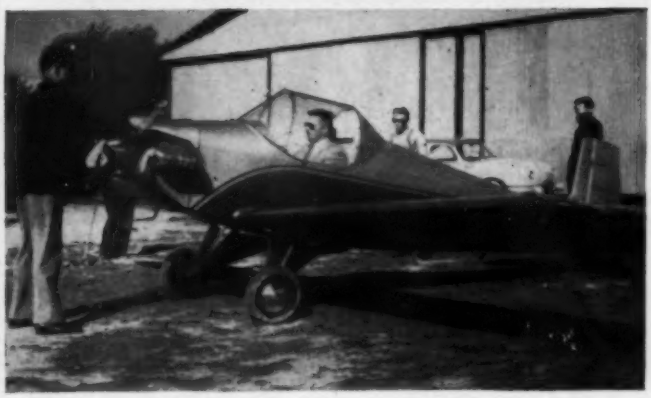
A magnificent reception was laid on at Cannes by the president, M. Carle, the honorary president, M. Lusteguy, and the directors, M. Jean, M. Pennacchioni and M. Magne. The remaining test at Cannes was a *concours d'elégance* for both aircraft and crews, won by Mr. Burgerhout and his Bonanza. Vico Rosaspina came second with the Falco; Mr. Lang, third; M. and Mme. Rébillon, fourth; Herr and Frau Junius, fifth; and M. and Mme. Querey, sixth.

Altogether the two contests proved highly successful and it is hoped that in future years they will grow in importance.

—AND AN ULTRA-LIGHT RALLY

THE Réseau de Sport de l'Air had better luck than their British counterpart, the Popular Flying Association, in organizing their annual *Rassemblement*, which this year was held at Caen. Despite "seasonal" weather on the first day of the weekend, a total of 57 aircraft had arrived by mid-morning on the Sunday. These ranged from the ever-popular Turbulent of Monsieur Clochez to a Percival Q.6 from Cambridge. Fifty-seven—considering the variety of types lined up outside the clubhouse—seemed an apt number.

As in previous years, last month's *Rassemblement* took the form of a meeting of enthusiasts for amateur aviation, with the emphasis on amateur construction. Seeing these aeroplanes and their occupants at Caen could leave one in no doubt as to the steady and imposing growth of the French ultra-light movement. Additionally, the amount of official interest and open support by important members of the aviation fraternity was clearly shown; numerous representatives of official bodies and sporting aviation interests were present. Following close on the heels of our own P.F.A. affiliation to the Royal Aero Club, the presence of Col. Preston (R.Ae.C. secretary-general) was a pointer that all is not moribund in the British light-aviation sphere.



Two interesting new French variants: (upper) the Jodel-Wassmer, powered by a Continental C.85 engine, and (lower) the Porsche conversion (Volkswagen engine with Porsche cylinders) of the Druine Turbulent single-seater.

A notable result of the amateur-constructor movement in France is the small industry which has grown up around the amateurs. There are now several small firms building Jodel two-seaters and Piel Emeraudes under licence, and these seem to be selling at a reasonable rate due to the State subsidy available to the light-aircraft purchasers. The purpose of this subsidy is to develop the sale of French light aircraft, encourage youth to fly, and maintain and improve the number of craftsmen.

This year sees the Jodel D.112 established, if numbers are anything to go by, as one of the world's most popular light aircraft. Several present at the *Rassemblement* carried constructor's numbers over 450 on their rudders. The Coupe Sylvain Badez, awarded for the best amateur-built two-seater, was won this year by the first amateur Jodel D.117 (that is, a Jodel D.112 fitted with a Continental C.85 engine). In passing, these dollar engines are now obtainable new in France, with a starter and generator fitted. This particular aircraft, constructed by the Ligue Aéronautique Havraise (whose Minicab won last year), is without a doubt one of the most superbly finished wooden aircraft ever produced. Such was the smoothness of its white polished skin that Col. Preston had to be re-assured by the French Bureau Véritas expert on the panel of judges that the machine was not professionally built. The regular alignment of the slots in screw-heads, for example, would have delighted the most finnicky sergeant-major. A notable modification on this and numerous other Jodel two-seaters present was the addition, at the aileron tips, of mass-balance weights to the previously simple, unbalanced and unslotted surfaces. As a result of this, and by careful regard for cable tensioning and static friction, the lateral characteristics of the type seem somewhat improved, particularly when holding on banks in sideslips.

Although it was not possible to fly the prizewinner, an hour's flying in a similar aircraft was most interesting. This machine was kindly made available by Monsieur Favriel, one of the most enthusiastic of R.S.A. members. As I had previously flown several 65 h.p. Jodels this aircraft did not feel unfamiliar; features causing immediate new impressions were the detailed changes in the cabin. This particular machine was professionally built by Lucien Querey at Bernay and was certainly much superior in the cabin to some of the more rustic versions. The throttle control is now a central push-pull knob with carburettor heat and mixture knobs close by and clearly marked. A starter isolation switch with a green warning light is fitted on the starboard side of the dashboard with an adjoining "pull to operate" starter button which can only be operated when a spring-loaded safety-

(continued on page 541)

HERE AND THERE

ON THE BEACH at Southport, Tiger Moth G-ANOD illustrates the sand-and-water diet on which, with the help of Southport Aero Club members, it thrives — though high tides sometimes prevent flying. The Tiger has to be washed down daily to prevent corrosion.

Vulcan in America?

BEFORE leaving Britain recently to visit A. V. Roe, Canada, Ltd., Sir Roy Dobson, managing director of A. V. Roe and Co., Ltd., commented that the Americans "wanted to see the Vulcan" and he thought the aircraft would be going over to the U.S. Sir Roy was confident that it could beat the North Atlantic record on its return trip, and also that next year the Vulcan would "knock sky-high" existing records to Australia.

U-2 Lost

A LOCKHEED U-2 high-altitude research aircraft disintegrated in mid-air near Kaiserslautern, Germany, on September 17. The pilot was killed. Wreckage was found scattered over a distance of about eight miles.

High-lift Venture

PRODUCTION of the Custer channel-wing aircraft has been taken over by a new company in McAllen, Texas. Headed by Louis Leone, a local real-estate and building contractor associated with oil and cattle interests, the Custer Channel Wing Mfg. Corporation, as the new company is called, will go into immediate production with two- and five-seat models.

Air-Fouga Formed

THE Fouga aircraft works (where the Fouga Magister twin-jet trainer is produced) are in future to be operated by a new company, known as Air-Fouga, set up by five French firms—Bréguet, Dassault, Morane-Saulnier, Sud-Est Aviation and Ouest-Aviation. M. Glasser, president of the Association of French Aircraft Industries and of Ouest-Aviation, will act as manager and M. Durodie as director-general.

Talking about Turbines

A CONFERENCE on gas turbine development is being held at North Herts Technical College, Letchworth, on October 20 and 21. Among the papers to be read, covering various aspects of industrial and transport application, is *Air Development*, by A. W. Morley, Ph.D., M.Sc., A.C.G.I., A.F.R.Ae.S., Wh.S., head of the Napier forward projects department. Details of the conference, which may be attended on either a residential or non-residential basis, can be obtained from the Principal of the College, at Broadway, Letchworth, Herts.

Rotorcraft "Standard Costs"

THE Society of British Aircraft Constructors (29 King Street, St. James's, London, S.W.1) has recently published a supplement extending to rotorcraft its standard method of estimating aircraft operating costs. Major operators of scheduled and non-scheduled helicopter services have been consulted and their cost data analysed and expressed as an average of world conditions.

Acceleration

AT Woodridge, New Jersey, the Curtiss-Wright Corporation has announced the development of a "hypersonic test vehicle" said to reach "several times the speed of sound" two seconds after take-off. Fifteen experimental models of the vehicle, designed in co-operation with the U.S.A.F. Research and Development Command to gather data at high supersonic speeds, have already been fired.

Cranfield Reunion Dinner

THE tenth anniversary of the College of Aeronautics is to be celebrated at a reunion dinner at the Connaught Rooms, Great Queen Street, London, W.C.2, at 7 for 7.30 p.m. on Friday, October 26. All past and present students, members of staff and others associated with the College are invited to attend and to bring guests; tickets, price 26s, are obtainable from Mrs. F. Dixon, The College of Aeronautics, Cranfield, Bletchley, Bucks.

Lilienthal Stamp

THE sixtieth anniversary of the death of Otto Lilienthal (1848-96) was marked on August 9 by the issue in West Berlin of a set of 25 pf. stamps. Their design depicts the memorial to the pioneer, who died as the result of an accident while gliding from the Rhinower Hills near Stöllen.

Thirteenth T-33 Contract

AN order for T-33s totalling £7½m has been placed with Lockheed Aircraft Corporation by the U.S. Air Force. This order, the thirteenth successive contract for T-33 standard jet trainers placed by the U.S.A.F., extends production into mid-1958 and will bring output of the type to nearly 5,500.

Acting Rank

COMMENTING on a Farnborough report reference to himself as Hawker chief test pilot, A. W. ("Bill") Bedford tells us that he is acting only temporarily in this capacity during the absence of Neville Duke, who has been resting following his recent "slipped-disc" trouble.

Helicopter Lecture Season

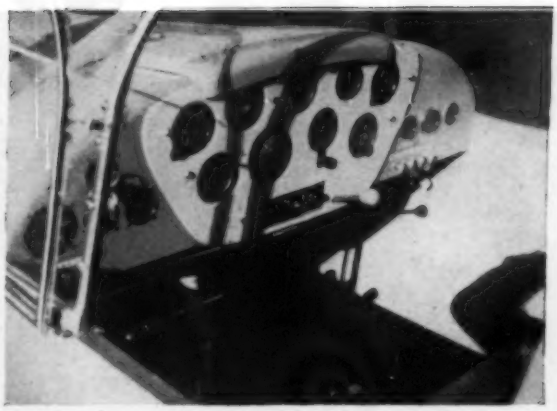
ON Friday, October 5, Mr. P. D. MacMahon, of Saunders-Roe, Ltd., is to open the 1956-57 lecture programme of the Helicopter Association with a paper on *Strain Gauge and Blade Motion Recording Systems for Helicopters*. It will be read at 6 p.m. in the library of the Royal Aeronautical Society.

A.T.C.O. Guild Expansion

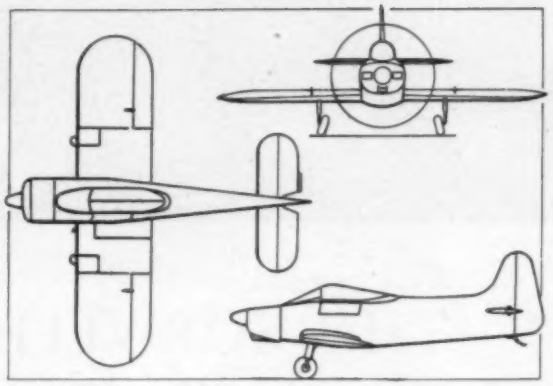
THE second lodge of the Guild of Air Traffic Control Officers, to be known as the North Western Lodge, was established in Manchester last Friday. At the inaugural ceremony Mr. E. Vincent Miller, Master of the Guild, presented a warrant of constitution to the Master of the Lodge, Mr. N. Vernon, who is an air traffic control officer at Manchester.

SUBMERGED HERCULES: A two-year programme of static testing of the Lockheed C-130A Hercules combat transport aircraft has been completed, including underwater tests involving twice the in-flight pressure differentials. Underwater fatigue tests with simulated flight loads are now due.

(Left) M. Clochez, winner of the Coupe R.S.A. for the third successive year, and the nose of his immaculate Turbulent.



(Upper right) Cockpit of the 90 h.p. (Continental) version of the Piel Emeraude.



(Right) The Jurca D.J.2 Tempête single-seater, which is powered by a 65 h.p. Continental.

ULTRA-LIGHT RALLY

(*continued from page 539*)

catch is lifted. The door locks are still of the very simple "garden privy" variety, but a second bolt, which is spring-loaded, has been added at the windscreen to prevent inadvertent opening of the hood in flight. The trimmer is now a small lever on the port side of the cabin and is not marked. (This is not a good thing, particularly as there is a similar lever nearby—the purpose of which is unknown!) A most attractive piece of equipment is the S.A.N. six-channel radio with its control-box fitted at the top of the instrument panel and a loudspeaker at the rear of the cabin with an alternative plug-in for headphones. The set gives excellent performance and is achieving wide popularity in France.

The 90 h.p. Jodel with two up positively leaps into the air and has a most satisfying rate of climb of about 1,000 ft/min, although vibration is marked at full power. The noticeable feature of the climb is the brisk yaw to the left if the feet are removed from the pedals. It does seem like spoiling the ship for a ha'porth of tar for a fin not to be fitted; it should then not be necessary to have the rudder spring-loaded. It is noticeable on this version that some fin-area is in fact provided by a small fairing mounted on the tailplane. Presumably the fact that a light aeroplane of this size is usually flown the whole of the time with more-or-less constant correction being applied on comparatively light controls covers up for the existence of neutral stability. Also, of course, many practical flying instructors curse the aeroplane which does not have to be flown classically.

To stall the Jodel requires a really nose-high attitude to the flight path. In straight flight this version stalls at about 50 km/hr I.A.S., the nose dropping cleanly without much height being lost. Sideslips are better than on previous versions, the aileron loads being lighter.

Another 65 h.p. aircraft now available in 90 h.p. form is the Piel Emeraude. This type is becoming well established and three arrived at Caen. One amateur-built machine was frankly untidy and showed a lack of skill in detail finish, but the version present with the 90 h.p. engine was a most attractive aircraft with very superior instrument installation and upholstery. Unfortunately a gale-force wind prevented a trial flight in this machine on the day it was available. Again, in passing, it is significant that although such progress is being made one is conscious that a great deal of it has all happened before. The casual arrival at Caen of a 90 h.p. cabin-version Moth Minor underlined the position this country once held in the light-aircraft field. Here is a design of 20 years ago which many visitors to the *Rassemblement* thought was a post-war product!

Apart from the variety of Jodels, several notable little aeroplanes were present. The Coupe R.S.A. for the best single-seater went again to Monsieur Clochez for his Turbulent. Having won this cup three times he now keeps it, and there can be no prouder man in France than this friendly and "most young" enthusiast. A prototype of another branch of ultra-light aviation was the Jurca D.J.2 Tempête, which is a single-seater, parallel-chord, low-wing monoplane which uses many Jodel parts in its construction. The influence of Max Plan can also be seen in the design; and although not pretty, with its plank wing without dihedral, it can certainly be regarded as a sportsman's mount somewhere in the Comper Swift class. The engine fitted is a 65 h.p. Continental. In the other class of ultra-light a nicely turned out little Pipistrelle was present, showing itself to be a delightful example of the ever-popular parasol monoplane.

While there is never any set programme of demonstrations at R.S.A. meetings there is always plenty going on and the circuit is at all times very busy. Naturally a large part of the time is spent in flying in the other man's aircraft; it is a great game bringing pilot, passenger and aircraft together at the same time.

Contrary to the practice at most French air-rally dinners, the R.S.A. do not believe in long and ponderous speech-making. The *vin d'honneur* at midday, with a brief speech of welcome to the participants, followed by an excellent lunch with local flavour, was a pleasantly informal affair held in the hangar. An equally informal dinner was held in the railway station buffet at Caen. The reader may think this latter rather funny in terms of British Railways' stations; but, although the setting—to British eyes at least—was perhaps a little unusual, there was no doubt that the organizers had chosen well.

One unfortunate snag affecting the visitor who fondly imagines that all French ultra-light aircraft go to the R.S.A. rally is that several interesting aircraft are always busy earning their bread and butter and therefore cannot attend. Such an aircraft was the latest version of the Druine Turbulent belonging to the Aero Club at Avranches. This version is fitted with a Volkswagen engine having Porsche cylinders and pistons giving a capacity of 1,500 c.c. The aircraft was professionally built and the owner therefore apologized that he could not really bring it to a rally of amateur constructors—it was, in any case, busy in club use. An invitation to go to Avranches and try this version was readily seized, however, and provided a most refreshing 20 minutes' flying. The first notable feature was the cabin, a totally enclosed Perspex structure folding sideways and providing ample headroom. The second was the finish and cabin lining, which were exceptional and had everything normally found in large aircraft such as shoulder harness, parking brake and, luxury of luxuries, a V.H.F. set.

An impulse starter permits the engine to be started very easily and, with about 2,700 r.p.m. for take-off, the Turbulent roars into the air and climbs like a little fighter. Controllability is superb and the rumour that François D'Huc Dressler is considering a slightly strengthened version for the next Coventry meeting could easily be believed. Cruising speed is a steady 95 m.p.h. and one feels that here indeed is a real sports aircraft.

While visiting the *Rassemblement* an opportunity was also taken to visit the S.A.N. factory at Bernay. Here the Jodel D.117 is in production on a scale of up to six per month. The standard of work was most impressive and a healthy production-line of Jodels was being worked on, an interesting feature being the stocks of parts for future production. The most conspicious of these comprised a line of about 100 glass-fibre wheel spats, which brought home once more the fact that production of French ultra-lights is not merely being played at, but is big business.

H.B-D.

A standard production 1½-Strutter with Scarff No. 2 ring mounting over the rear cockpit.

THE SOPWITH 1½-STRUTTER

HISTORIC MILITARY AIRCRAFT No. 14 PART I By J. M. BRUCE, M.A.

IN this latest article in his series of studies of World War I aircraft Mr. Bruce deals with the Sopwith 1½-Strutter, which was the first British military aircraft to go into service with a synchronized Vickers gun as standard equipment. The author wishes to record his indebtedness to Mr. Bruce Robertson for much of the information—which will appear in a subsequent instalment—relating to serial numbers.

FORTY summers ago, in the dawn of that Saturday which was the first day of July 1916, a river valley in France lay softly shrouded in mist; mist which was soon dispersed by the sun to reveal the promise of a perfect summer day. But there was no peace in the Somme Valley that morning. Europe was at war, and for seven days the river had been a mute witness of a ceaseless, intense artillery bombardment of the German defences along the entire British front and the French front north and south of the river.

At 6.25 a.m. on that first of July the bombardment swelled to hurricane intensity. Cecil Lewis, one of the R.F.C. pilots who were flying above the Somme that morning, was to write in later years:—

> "It was the greatest bombardment of the war, the greatest in the history of the world. . . . It was now a continuous vibration, as if Wotan, in some paroxysm of rage, were using the hollow world as a drum and under his beat the crust of it was shaking. Nothing could live under that rain of splintering steel."

After which it comes as something of an anti-climax to learn from the official history that "Aeroplanes of No. 70 Squadron which left to reconnoitre Cambrai at 6.0 a.m. were back on their aerodrome an hour and twenty minutes later. They had met with no opposition and reported no unusual movements." At 7.30 a.m., ten minutes after No. 70's patrol had landed, British troops advanced against the enemy, and the vast agony of the Somme had begun.

In the Order of Battle of the R.F.C. on July 1, 1916, the strength of No. 70 Sqn. is quoted as eight Sopwith two-seaters, but a following note states that four of these did not arrive until July 3. At that time there was no official system of nomenclature for aircraft—in fact, none was introduced until 1918—and the name "Sopwith two-seater" might have referred to any one of several types of Sopwiths. But the sense of humour of the flying fraternity of the time ensured that that particular Sopwith two-seater had a name of its own; and it is certain that no aeroplane ever flew to war under a quainter style than did the Sopwith 1½-Strutter.

The 1½-Strutter was not by any means the first Sopwith two-seater, nor was it the first Sopwith two-seater to serve with the R.F.C. and R.N.A.S. A two-seat tractor biplane powered by a 70 h.p. Gnôme had appeared in 1912, and the following year saw the debut of the excellent aircraft, originally a three-seater and fitted with the 80 h.p. Gnôme, which was ordered in small numbers for Britain's infant flying services. The Service aircraft were usually flown as two-seaters, and the type saw limited operational use in the early months of the war.

Contemporary with the 80 h.p. Gnôme biplane was the first Bat Boat, and it was succeeded by the workmanlike side-by-side two-seat biplane (100 h.p. Gnôme Monosoupape) which was supplied to the Admiralty with the official serial number 149. Mr. Winston Churchill had some dual instruction in this machine. It crashed on March 25, 1914, when being flown by Lt. Spenser Grey.

There followed the excellent seaplane (100 h.p. Green) in which Harry Hawker and H. Kauper made their gallant attempt to win the 1913 *Daily Mail* Round-Britain Contest and failed only by sheer bad luck.

Although the Sopwith Tabloid (80 h.p. Gnôme) of November 1913 originally appeared as a side-by-side two-seater, the production machines supplied to the R.F.C. and R.N.A.S. were single-seaters. The next Sopwith two-seater was a handsome tractor biplane powered by a 100 h.p. Gnôme Monosoupape, which was built to participate in the 1914 Round-Britain Contest. It first appeared with a wheel undercarriage, but still had a good performance when fitted with the float undercarriage for which it was designed.

The outbreak of war prevented the Round-Britain race from taking place, but several examples of a development of the Sopwith seaplane were supplied to the Admiralty. In the R.N.A.S. the Service machines were officially known as Types 806 and 807 and, although supplied only in small numbers, they saw operational use in several parts of the world. From the Admiralty seaplane an equal-span landplane, also powered by the 100 h.p. Monosoupape, was developed. Two dozen were supplied to the R.N.A.S. and were used as anti-Zeppelin patrol aircraft, but their performance was poor and their Service life brief. For an obvious (and occasionally disastrous) reason these Sopwith two-seaters were nicknamed "Spinning Jennies" by their pilots.

Apart from the few pusher Gun Buses converted from a batch of seaplanes originally ordered for Greece, the Spinning Jenny was the last Sopwith two-seat military landplane to appear before the 1½-Strutter, but at least five other two-seat tractor seaplanes* emerged from the Sopwith works between late 1913

* *These were the big torpedo-carrier (200 h.p. Salmson), the seaplane with 100 h.p. Anzani radial engine, the little-known machines which had the official serial numbers 137 and 138, and the big Admiralty Type 860 which had the 225 h.p. Sunbeam engine.*

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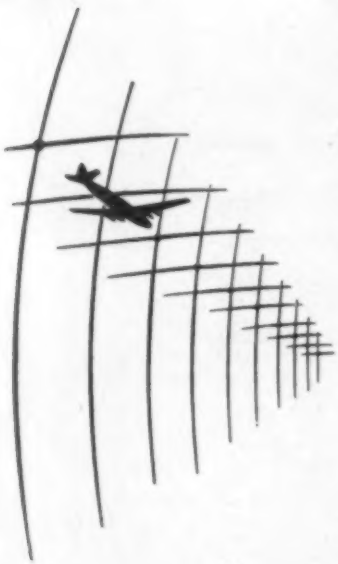

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THE SOPWITH 1½-STRUTTER . . .

and the summer of 1915. In that summer the so-called "Sigrist Bus" was first flown.

Several of these types were supplied to the flying Services, principally the R.N.A.S.; consequently the Sopwith company acquired some insight into Service requirements. Nevertheless, the pattern of the war in the air was ill-defined in 1915, a fact which was reflected in the variety of forms assumed by the aircraft of the time. All aircraft designers were, however, already striving to obtain the all-important combination of good performance and effective armament.

In those days, broadly speaking, good performance was obtainable in an aircraft by making it a tractor; while effective armament could be installed only in pusher types. A number of remarkable attempts at compromise saw the light of day. Examples of such machines were the Mann and Grimmer M.1 with its nose-mounted engine driving outboard pusher airscrews; the dangerous B.E.9, with gunner's cockpit virtually suspended in front of the tractor airscrew; the Bristol S.2A, with a gunner seated beside the pilot; the Sage Type 2 with its enclosed cockpit and gunner's position in the upper centre section; and the escort fighters Armstrong Whitworth F.K.12, Sopwith L.R.T.Tr. and Vickers F.B.11, all of which had their gunners' cockpits in rather improbable positions.

The crux of the problem lay, of course, in providing armament which was unhampered by the frontal disc of the tractor airscrew. A few far-sighted men realized that the ideal arrangement of armament in a fighting aircraft was for the gun or guns to be fixed and parallel to the machine's line of flight; thus the armament could be brought to bear by aiming the aircraft at its target. Accessibility for reloading and stoppage-clearance made the installation of such a gun in the fuselage desirable. That, in its turn, meant that the gun had to fire through the revolving airscrew. The earliest recorded reference to any device for regulating the fire of a weapon through a revolving airscrew is in a patent granted as early as 1910 to the pioneer German aviator and constructor August Euler. It is doubtful whether he ever attempted to produce a working example.

One of the more melancholy facts in our military aircraft history is that a British gun-synchronizing gear was patented in 1914. The patent was No. 23790 of that year, and was taken out by the Edward brothers who, in 1911, had built and flown their Rhomboidal Biplane. A working model of the Edward gun gear was sent to the War Office. The fate of that model is unknown, but the first British aeroplane fitted with a gun-synchronizing gear did not reach France until March 25, 1916: the aircraft was a Bristol Scout fitted with the Vickers-Challenger synchronizing gear. Deplorable though that lapse of time may have been, it is nevertheless significant that the first example of the Fokker synchronizing gear did not fall into British hands until April 8, 1916, when a Fokker monoplane made a forced landing in the British lines and was captured intact.

Anthony Fokker has freely admitted that the germ of his conception of a machine-gun synchronizing gear was provided by his inspection of the armament installation in the Morane-Saulnier monoplane flown by Roland Garros of Escadrille M.S.23 which was obliged to land near Ingelmunster on April 19, 1915. Garros had fitted his aircraft with a primitive (but effective) device invented by Eugene Gilbert in 1914: a Hotchkiss machine-gun was rigidly mounted on top of the fuselage and the airscrew was fitted with wedge-shaped pieces of armour-plate which deflected any bullets which did not pass between the blades of the airscrew. Gilbert shot down an L.V.G. biplane as early as December 7, 1914, but seems to have left the more extensive use of his device to Garros, who shot down five enemy aircraft between April 1 and 19, 1915.

Gilbert and Garros did not, therefore, invent a gun synchronizing gear, but they did demonstrate the desirability of mounting fixed forward-firing armament in fighting aircraft. Fokker, in collaboration with Hans Schneider of L.V.G., quickly produced a mechanism which simply ensured that the machine-gun did not fire when an airscrew blade was in a position to be struck by a bullet. In short, it was a true interrupter gear. That the invention was a success was unquestionable—the mounting Allied casualty lists from the summer of 1915 onwards are proof of its efficacy.

The advent of the Fokker monoplane with its deadly armament did not inspire British efforts to produce a gun-synchronizing gear, for, despite the apparent neglect of the Edward brothers' gear, research and experimental work had been going on in Britain for some months before the Fokkers began their depredations on the Western Front. There can be no doubt, however, that the knowledge of Germany's possession of a practical synchronizing gear acted as a spur to British efforts.

It is possible that success was delayed because the standard machine-gun used in British aircraft was the drum-fed Lewis,

Early-production 1½-Strutter for the R.F.C. with the Nieuport ring mounting over the rear cockpit. This machine was built by Ruston, Proctor and Co.

and all the early experiments were conducted with it. It suffered from two disadvantages: it could fire only a limited number of rounds before having to be reloaded, and the masses which had to be accelerated in the gun were so heavy that the fitting of any kind of purely mechanical interrupter or synchronizing gear was a difficult matter. (A synchronizing gear for the Lewis gun was in fact designed by Sergeant-Mechanic Alkan of the French air service and fitted experimentally to a few R.F.C. aircraft in the spring of 1916. The development of successful British gears led to the discontinuation of the trials of the Alkan gear, but numbers of Sopwith Baby and Fairey Hamble Baby seaplanes were armed with synchronized Lewis guns. While the Sopwith B.1 was undergoing operational trials with the R.N.A.S. Fifth Wing it had a single fixed, synchronized Lewis, and the little-known Saunders T.1 two-seater of 1918 had a similar armament installation for its pilot.)

The great Vickers company was a late entrant in the gun synchronizing field, for it was not until November 1915 that, under the direction of the Director-General of Military Aeronautics, Vickers engineers began to examine the problem. A practical synchronizing gear, designed by G. H. Challenger, was produced in the following month. The weapon for which it was designed was the Vickers machine-gun, a gun which had until then been regarded as too cumbersome and, by virtue of its belt feed, unsuitable for use in aircraft. Since the object of the synchronizing gear was to provide for a fixed gun these objections were no longer valid, and the Vickers gear was put into production for the Royal Flying Corps.

The Vickers device was a form of link motion which, in effect, made the airscrew fire the gun when a blade was not in a position to be struck by a bullet. This stamped it as a synchronizing gear, different in principle from the Fokker interrupter gear in which the gun was prevented from firing when the airscrew blades were in the line of fire.

Production of the Vickers gear was initiated at the company's Weybridge works, but deliveries to the R.F.C. were delayed by a shortage of Vickers guns. The army could spare very few to the R.F.C., and it was not until February 1916 that production of the necessary guns began to increase sufficiently to permit the introduction of the valuable new weapon in British aircraft.

An early-production 1½-Strutter for the R.N.A.S., photographed before the fitting of armament.

A 1½-Strutter with the cranked pillar mounting for the observer's gun and partly faired Vickers gun.

THE SOPWITH 1½-STRUTTER . . .

As noted earlier, the first machine to go to France fitted with the Vickers synchronizing gear was a Bristol Scout.

The first aircraft to be produced with a synchronized Vickers gun as standard equipment was the Sopwith 1½-Strutter, and the first to join the R.F.C. in the field were the four machines of "A" Flight of No. 70 Sqn., which went to France on May 24, 1916. They were not the first 1½-Strutters to go to France, however; and to set all matters in correct perspective it is necessary to go back to the spring of 1915, when a new two-seat biplane emerged from the Sopwith works. It was known in the company's works as "the Sigrist bus", having been designed by Fred Sigrist.

The new machine was powered by an 80 h.p. Gnôme rotary engine which was installed in a fore-and-aft mounting and enclosed in a bull-nose cowling similar to that of the Sopwith Tabloid. As on the Types 806 and 807 seaplanes and Spinning Jenny, the fuselage had dorsal fairings in front of, between and behind the cockpits. The wings were of unequal span, and the interplane struts were raked outwards. The machine flew in the early summer of 1915, and was the subject of many experiments which aimed at varying the position of the centre of gravity. In June 1915 Harry Hawker flew the aircraft to a new British record altitude of 18,393ft.

But the most interesting feature of the Sigrist bus—at least as far as this narrative is concerned—lay in the central bracing of its upper mainplane. There was no centre section; the two halves of the wing met on the aircraft centre line and were connected to the fuselage by a trestle-shaped cabane. From the upper longerons additional struts ran upwards and outwards to meet the wing spars: thus, when seen end-on, the bracing structure resembled a letter W.

Bracing of identical form characterized the new Sopwith military two-seater which was passed by the Sopwith experimental department on December 12, 1915. Just as the originators of the names of the Pup and Camel have remained anonymous, so has the inventor of the name of the 1½-Strutter; but there is no doubt that the aircraft owed its odd title to the wing bracing. The outer struts of the central structure were regarded as interplane struts which had had to be attached to the upper longerons because they were not long enough to reach the lower wing. The name 1½-Strutter was, of course, unofficial—indeed, it might almost be said that the 1½-Strutter founded a kind of tradition by which Sopwith aircraft acquired facetious names which were at first frowned upon officially but became so widely used that they had ultimately to be accepted.

Forty-one years is a long time in the aviation time-scale, and it is perhaps pardonable that the jet age might fail to recognize the fact that, in its day, the 1½-Strutter was a remarkably advanced aircraft. It is as well to remember that, on July 1, 1916, No. 11 Sqn. still had four Vickers Gun Buses on its strength, and that, with the possible exception of the two Nieuport two-seaters which were on the strength of No. 1 Sqn., the only R.F.C. two-seaters capable of giving a good account of themselves in combat were the F.E.8s and 2Ds.

In the 1½-Strutter the Sopwith company provided a two-seater with a performance comparable with that of contemporary scouts, and effectively armed with machine-guns fore and aft. It was the first true two-seat fighter to see service, the pioneer of a category of military aircraft which included such magnificent machines as the Bristol Fighter and the Hawker two-seaters. And yet the 1½-Strutter is not one of the best-known aircraft of the 1914-18 war. A possible reason for its relative obscurity is that it was so closely followed by the Bristol Fighter that it may have been somewhat overshadowed by that great aeroplane. Another reason is that the War Office were unpardonably slow to order the 1½-Strutter, doubtless because of their preoccupation with production of the B.E.2C, 2D and 2E, which, considered as military aircraft, compared unfavourably with the Sopwith two-seater.

There was nothing unconventional about the 1½-Strutter's airframe. The fuselage was a single box-girder composed of wooden longerons and spacers cross-braced with wire and covered with fabric; the decking about the cockpits was plywood-covered. In the first bay immediately behind the engine mounting there were substantial wooden diagonal members, and the outer covering consisted of aluminium panels. Rounded fairings blended the circular cross-section of the engine cowling into the flat sides of the fuselage: these fairings were made of light stringers notched into formers, and they extended as far aft as the rear cabane struts. The engine of the prototype 1½-Strutter and the first production machines was the 110 h.p. Clerget rotary, which was installed on an overhung mounting within a circular open-fronted cowling.

The undercarriage was a plain vee structure made of steel tubing. The 1½-Strutter was the first Sopwith type to have the form of wheel attachment which was to characterize the majority of the company's later products. Each wheel was mounted on a half-axle which was pivoted at its inner end about a point near the middle of the spreader bars. The half-axle had limited vertical movement in a slot at the apex of its vee strut and was restrained by rubber shock-cord in tension. Thus each wheel was independently sprung.

Another feature which first appeared on the 1½-Strutter but came to be recognized as typically "Sopwith" was the characteristically shaped fin and rudder. These components were of steel tube construction. The large tailplane had two wooden spars which were cross-braced internally.

The mainplanes were of conventional wooden construction, with two main spars and the usual compression struts and internal cross-bracing. The single-bay external bracing incorporated double flying wires. The upper mainplane was built in two halves, and its central bracing has already been described: the cabane and half-struts were all of steel tubing of elliptical cross-

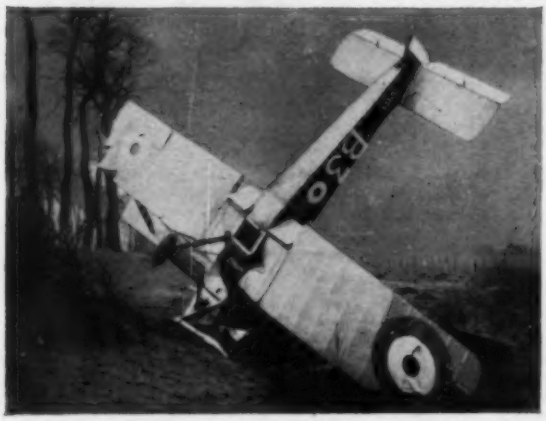
Standard Clerget-powered 1½-Strutter for R.F.C., showing transparent panels in the upper wing.

section. A centre-section was provided for the lower wings: it was quite wide and had no dihedral angle.

The pilot sat directly under the upper mainplane, in which position he had a good forward and downward view, but could see little above and behind him. In many 1½-Strutters a considerable area of the upper mainplane was covered with transparent material in order to improve the pilot's view. The main fuel tank was installed immediately behind the pilot's seat. A small service tank was installed above and behind the engine, petrol being forced into it by a small wind-driven pump usually mounted on one of the cabane struts. A hand pump was also fitted in the pilot's cockpit. As the position of the main tank made it impossible for the observer's cockpit to be placed immediately behind the pilot, an appreciable distance separated the two.

The Sopwith 1½-Strutter introduced Service pilots to the adjustable tailplane. Its incidence could be varied in flight by means of a handwheel in the pilot's cockpit. This innovation was probably something of a necessity, for Captain Norman

Clerget-powered single-seat bomber 1½-Strutter in French service.



Two unlucky 1½-Strutters: (Top), R.N.A.S. machine, showing air brakes fully applied. (Lower picture), single-seat bomber of R.N.A.S. Fifth Wing, showing axis of air brakes and position of fuselage bomb cell.

Macmillan has recorded that the 1½-Strutter was a very stable aeroplane which strongly resisted any sudden change of attitude, and that it required all of a pilot's strength and skill to put it into a dive.

The adjustable tailplane was probably used a good deal more than the other aerodynamic novelty with which the 1½-Strutter was fitted. Behind the rear spar of the lower centre section were two movable surfaces which were intended for use as air-brakes. It is possible that no other feature of any 1914-18 aircraft has been so repeatedly misrepresented as the 1½-Strutter's air-brakes, for they have been described time and again, explicitly or implicitly, as trailing-edge flaps of the lift-increasing kind. That is what they were not, for they moved *upwards* until they presented flat surfaces squarely at right angles to the airflow. Moreover, they were not hinged to the rear spar of the centre section; they were pivoted about a spanwise axis situated at about one-third of their chord, and were therefore aerodynamically balanced by the small portions which projected below the underside of the centre section. They were actuated by a lever in the pilot's cockpit.

It may now seem amusing that it should have been thought necessary to fit air-brakes to an aircraft with a landing speed as low as that of the 1½-Strutter, but no doubt they were fitted because the aircraft might be called upon to operate from very small fields. French notes on the 1½-Strutter advised the application of the air-brakes at a height of about 200ft of the approach. Singularly few references to their use have been recorded, however, and it seems probable that most pilots preferred to land without their assistance. The landing speed was no more than 35 m.p.h.

It should, perhaps, be recorded that the 1½-Strutter was not unique among British wartime aircraft in having air-brakes. The prototype D.H.1 was equipped with them; and, following an experimental installation in an R.E.5, air-brakes were a more or less standard fitting on R.E.7s. In these cases they were fitted to the fuselage, but the F.E.2A had a downward-moving flap on the trailing edge of its centre-section, and one F.E.2A had an experimental installation—possibly the first ever made—of a braking parachute. Air-brakes similar to those of the 1½-Strutter were fitted to the big Sopwith L.R.T.Tr. three-seat triplane of 1916.

Up to the time of the 1½-Strutter's appearance, the Sopwith company had been almost exclusively Admiralty contractors: with the exception of a small number of Tabloids supplied to the R.F.C., the company's entire output of military aircraft had been delivered to the Admiralty. Thanks largely to the intelligent open-mindedness of Mr. Winston Churchill (as he then was) when First Lord of the Admiralty, and to the keenly practical outlook of Commodore (now Rear-Admiral Sir) Murray F. Sueter as Director of the Air Department, the Admiralty pursued a policy of buying their aircraft from a number of manufacturing firms. This was rather different from the War Office's tendency to look first to the designs of the Royal Aircraft Factory; yet in more than one case the War Office had to admit the superiority of the types ordered by the Admiralty and to place belated orders for the manufacture of the aircraft concerned for the R.F.C.

As with so many of the better aeronautical products of the first World War, the prototype 1½-Strutter was built for the Admiralty; and the first production contract, for 150 aircraft, was placed by that Department. Deliveries began early in the spring of 1916, and by the end of that April No. 5 Wing of the R.N.A.S. had one complete Flight of 1½-Strutters. This Fifth Wing of the R.N.A.S. had been formed at Dover under Sqn. Cdr. Spenser Grey and moved into the newly-made aerodrome at Coudekerque at the beginning of March 1916. The Wing had been specially trained for long-range bombing duties, and its principal equipment consisted of Bréguet Vs and Caudron G.IVs.

The 1½-Strutters of No. 5 Wing flew first as escorts to the bombing aircraft, but they were later themselves used as bombers. At about 1.30 p.m. on August 2, 1916, ten bomb-laden Caudron G.IVs and one Farman F.40 of Nos. 4 and 5 Wings, R.N.A.S., arrived over the enemy aerodrome at St. Denis Westrem. Their bombing was controlled by the pilot of a 1½-Strutter, who flew independently of the main formation; this was a new departure in bombing technique. In response to the Sopwith's Very light signals the bombers changed formation from their wide vic to line astern. They bombed in succession, then reformed for their homeward journey. On the same day three 1½-Strutters of No. 5 Wing dropped thirty-one le Pecq bombs on an ammunition dump and railway sidings at Meirelbeke. Direct hits were scored but there were no resulting explosions.

On August 9 two R.N.A.S. pilots of the 5th Wing made gallant and accurate attacks on German airship bases in Belgium; both flew their 1½-Strutters without observers. Flt. Sub-Lt. R. H. Collet flew out to sea from Dunkirk and recrossed the coast east of Zeebrugge. As he neared the airship at Berchem Ste. Agathe he could see that the hangar was empty, so he flew on to Evère. Bombing from a height of only 150ft, he scored eight direct hits with le Pecq bombs on the airship shed—which, like that at Berchem Ste. Agathe, was empty. Flt. Sub-Lt. D. E. Harkness

Specially modified 1½-Strutter single-seater, flown from what was normally the rear cockpit and armed with twin upward-firing Lewis guns.

THE SOPWITH 1½-STRUTTER . . .

arrived at Evère in time to see the effects of Collet's attack. He dropped eight more le Pecq bombs, some of which struck the hangar, and went on to drop a further four bombs at Berchem Ste. Agathe. Just over two weeks later, on August 25, the Zeppelin sheds at Cognelée were attacked by two 1½-Strutters whose pilots had navigated 120 miles through thick weather to reach their target.

The latter raid was less successful, for no hits were registered and 1½-Strutter No. 9396 was forced down in Holland when its fuel was exhausted. The load of bombs and the long distance left the Sopwiths with fuel which gave no more than a nominal margin of safety, and a small navigational error was enough to be No. 9396's undoing.

By this time the 1½-Strutter's usefulness as a bomber had been established. The R.N.A.S. Fifth Wing attacked the Lichtervelde ammunition dump, the Hoboken shipyards, enemy aerodromes at St. Denis Westrem, Ghistelles and Handzaeme, and the Tirpitz and Hindenburg batteries. How much more useful work might have been done if the R.N.A.S. had had all the 1½-Strutters which were ordered by the Admiralty is a matter for conjecture.

Equally conjectural is the effect that the operations of No. 3 Wing of the R.N.A.S. might have had if it, too, had received its full quota of Sopwiths. In the history of the D.H.9 (*Flight*, April 6, 1956, page 385) reference was made to the formation of No. 3 Wing, the first unit of any flying Service ever formed specifically for strategic bombing. Its formation was intended to realize a long-standing Admiralty desire to conduct long-distance bombing raids against naval and military centres within German territory. The new bombing force had to wait for suitable aircraft; these, in the shape of the 1½-Strutter and Short Bomber, were forthcoming in the spring of 1916; and it was expected that aircraft and trained crews would be available in sufficient numbers for operations to commence in the early summer. It was expected that by July 1, 1916, the Wing would have twenty 1½-Strutter bombers, a further twenty 1½-Strutters for use as fighters, and fifteen Short Bombers.

It was arranged that No. 3 Wing should be based at Luxeil, from which place many enemy industrial and munitions plants could be reached by the Shorts and Sopwiths. To make the necessary arrangements for the accommodation of the Wing, Capt. W. L. Elder, R.N., went to France early in May 1916.

By an unfortunate coincidence, the date selected for the attainment of the new Wing's full strength was also that which had been selected for the launching of the great offensive on the Somme. Captain Elder's preparatory work was well advanced when the Admiralty received an urgent appeal for assistance from Major-General Trenchard, then General Officer Commanding the R.F.C. With the beginning of the operations on the Somme only a few weeks away, the R.F.C. was seriously short of aircraft. Difficulties of supply at home and the failure of some French manufacturers to fulfil contracts for engines had combined to make the R.F.C. deficient, by no fewer than 12 squadrons, of the number of aircraft estimated to be necessary to provide adequate co-operation with the Army. It was considered that the minimum essential reinforcement was four squadrons, a total of 72 aircraft. An urgent search at all Home Establishment aerodromes produced only twelve aircraft which could be operationally useful, and it was then that an appeal for aircraft was addressed to the Admiralty.

Neither the Admiralty nor the War Office can be said to have been consistently irreproachable in their handling of matters connected with the supply of aircraft and their equipment during the 1914-18 war; but it must be admitted that the Air Department of the Admiralty either introduced or produced a remarkable number of sound and valuable pieces of equipment. It had, too (with foresight which proved at least once to be quite providential) ordered war materials which were delivered in time to relieve uncomfortable supply difficulties. Moreover, it has always been fashionable to denigrate the Departments of State, civil or Service; consequently the Admiralty has always received scant credit for its more worthy actions.

So it has been in the case of the R.N.A.S. 1½-Strutters which were transferred to the R.F.C. in response to General Trenchard's appeal. The urgency of the situation was instantly recognized by the Air Department, and transfers of these valuable aircraft were begun at once. This sacrifice could only be achieved by depriving the R.N.A.S. of equipment. In particular the activities of No. 3 Wing were all but stultified: at the end of August the Wing had twenty-two aircraft ready for service, and it was not until October 1916 that there were enough aircraft to make bombing possible on a worthwhile scale. Between that time and the end of the year bad weather limited operations severely, but attacks were made on targets such as the Mauser factory at Oberndorf, the Thyssen works at Hagendingen, steel works at Volklingen, blast furnaces at St. Ingbert, and the iron works at Dillingen. Sopwith 1½-Strutters must have participated in all of those raids, raids which were the forerunners of more telling attacks on the same targets made by the Independent Force, R.A.F., in 1918.

So effective was the Admiralty's help to the R.F.C. that, by the middle of September 1916, no fewer than 62 1½-Strutters had been transferred from the R.N.A.S. Altogether, at least 77 were transferred. Later, when production of the 1½-Strutter had increased, the War Office repaid part of its debt to the Admiralty by transferring to the R.N.A.S. 37 1½-Strutters, supplied against R.F.C. contracts. Further help to the R.F.C. was given by sending No. 8 (Naval) Sqn. as reinforcements. Commanded by Sqn. Cdr. G. R. Bromet, the unit went to Vert Galand on October 16, 1916, and received its first aircraft on the 26th of that month. Only one Flight had 1½-Strutters, provided by No. 5 Wing of the R.N.A.S., but the two-seaters were soon withdrawn and were replaced by Pups on November 16, 1916.

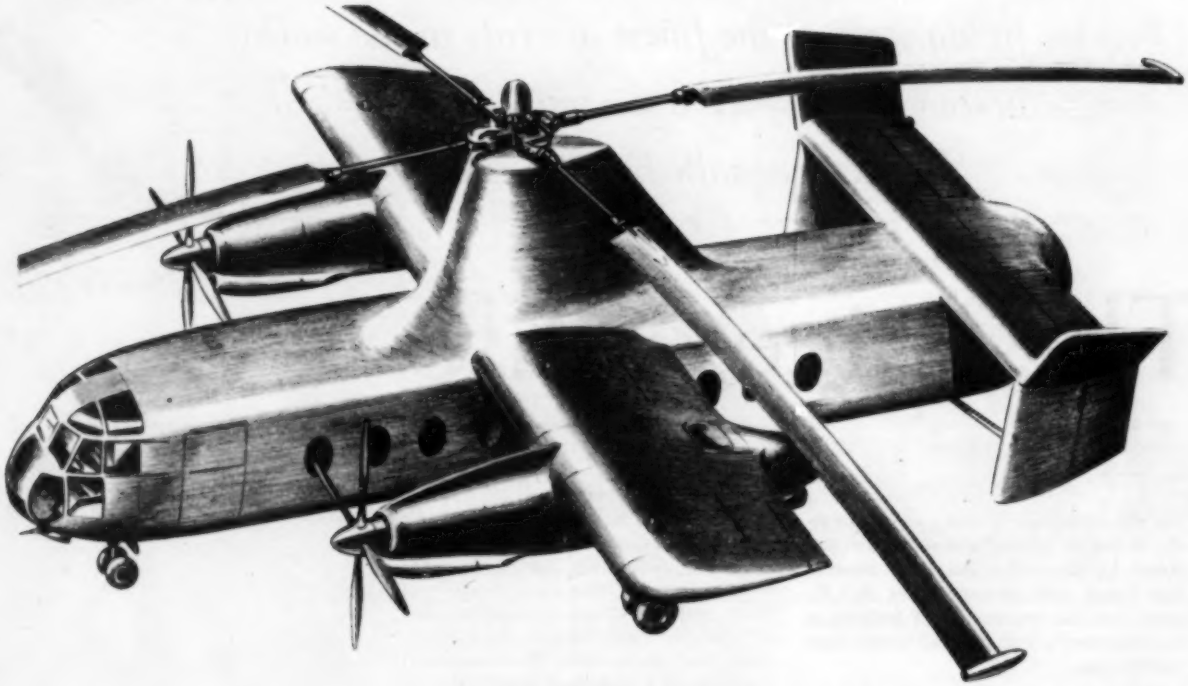
(To be continued)

"FLIGHT" PHOTOGRAPHS

MANY of the photographs reproduced in *Flight*, i.e., those taken by our own photographic staff (as indicated on publication) are subsequently available in the form of high-quality prints. Prices are as follows (dimensions given in inches): 5½×3½, 1s 4d (glossy or semi-matt, unmounted), or 2s (toned sepia, unmounted); 6×4, 2s 6d or 4s; 8×6, 3s 6d or 5s 6d; 10×8, 5s or 7s 10d; 12×10, 6s or 9s 8d; 15×12, 9s 6d or 13s; 20×16 (semi-matt only), 13s or 18s.

Also available are a postcard series, totalling over 200, depicting both historic and modern aircraft of the R.F.C., R.N.A.S., R.A.F. and Fleet Air Arm. A list of this card series is obtainable on application. Prices are 8d each card, or 7½d each for quantities of a dozen or more. One view only—in most cases a good three-quarter front or side—is available for each aircraft type.

The FAIREY



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The spice of life

On the ground and in the air — a man of many parts, with many parts to play.

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And the future? For all aircrew, the prospects are of the widest scope. You may gain your first Station Command at 40, or be chosen to pass through the R.A.F. Staff College, being groomed for the highest offices in the Air Force.

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The Royal Air Force

Flying ...and a varied career

(Advertisement)

The world is your parish in the Royal Air Force. You may go to any, or all, of a score of countries — to train, to observe, to command.

The R.A.F. is part of Britain's history and is still helping to make it. Your share, however small, can take you to the heart of things.

Here's a harder way to reach 10,000 feet, but it's a part of training, part of a big plan to make aircrew even more self-reliant.

Going where the weather's made is part of R.A.F. routine — and it can take you to the Poles or down to meet the sun.

There's every sport you could wish for, with leisure to enjoy them. And R.A.F. teams regularly compete in international competitions of all kinds.

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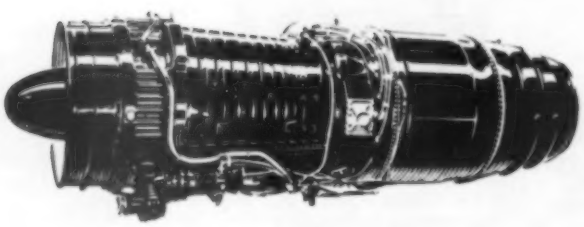
We prefer to advance into the future through the problems of the present, rather than to by-pass them by guesswork, however brilliant. In this way we build our aircraft engines on an ever-broadening basis of experience, and in this way such engines as the Sapphire—power unit of thirteen front-line aircraft —have been evolved. By applying an inexhaustible curiosity, combined with infinitely methodical approach, to the continuous development of these proven types, we not only meet the needs of today's aircraft, but anticipate those of tomorrow's.



ARMSTRONG SIDDELEY AERO ENGINES

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Members of the Hawker Siddeley Group

DRAWINGS BY
GORDON HORNER

With the Fighters in Phase 1 of the Year's Major Defence Test

STRONGHOLD WATERBEACH

F/O. Guynon of No. 253 Sqn. scrambles in a Venom N.F.3 from Waterbeach during Phase 1.

A CHARACTERISTIC controlled excitement comes with a major air exercise. In the headquarters and radar control and reporting organizations everyone is alert and expectant, concentrating on a vast chess-game played with high-speed, high-altitude pawns. The raiders are plotted, their intentions and strength assessed and, at the right moment, the signals flash down the lines to the airfields to scramble the sections of fighters and "talk" them on to their targets. On the airfields there are long periods of waiting for pilots seated in crewrooms or cockpits while the battle rages unseen and unheard. The scramble is a release from inactivity, a brief thrust into the high battle area where everything depends on speed and co-operation and attacks accurately pressed home. These sketches, made by Gordon Horner at Waterbeach, show something of the prelude and aftermath to the fighter pilots' operational work. Notes on Exercise Stronghold appear on page 558.

Coming up to stand-by at night, a ground crewman shines a torch to illuminate the cockpit for strapping-in.

Patience is a virtue on stand-by. F/O. "Kippah" Cox relaxes while waiting for the order to scramble.

Two No. 56 Sqn. Hunters taxi in for a rapid turn-round.

Surrounded by the trophies and decorations of No. 56 Squadron's coffee bar, F/O. "Daglander" Durwood takes time for tea.

A.V-M. H. P. Frazer (A.O.C. No. 12 Group), G/C. R. G. Dutton (Waterbeach Station Commander), and station officers salute Mr. Nigel Birch, Secretary of State for Air, as he leaves Waterbeach by Devon after a brief inspection.

Points of interest in the "Flight" photograph of the Fairey F.D.2 (left) are the rear-fuselage air brakes and the small intakes atop the fuselage. The Sabre in the picture above is referred to in the paragraph headed "Canadair Sabre F.4."

AIRCRAFT INTELLIGENCE

U.S.A.

North American F-107. This advanced version of the F-100 Super Sabre made its first flight recently from Edwards A.F.B. The 35-minute flight was deemed "very satisfactory," but the drag parachute failed on landing and the machine rolled from the 5,000-yd runway at Edwards on to the bed of Rogers Dry Lake, where the nose undercarriage assembly collapsed on striking a ditch. Damage was slight. Formerly designated F-100B, the F-107 has a "solid" nose and a bifurcated air intake on top of, and behind, the cockpit. The powerplant is a Pratt and Whitney J75 with afterburner.

Turboprop Observation Project. The U.S. Navy is seeking proposals for a two-seater 300 kt turboprop observation aircraft which would be used by the Army and Marine Corps also. The Avco Lycoming T53 or General Electric T58 is specified. The Army has already announced that it needs a machine capable of operating from a 500ft field over a 50ft obstacle. No armament is required, nor will there be any armour protection, except, perhaps, flak curtains.

Canada

Canadair Sabre F.4. A photograph on this page shows a Sabre F.4 with a somewhat curious history. Although bearing U.S.A.F. markings, it is, in fact, a Canadair-built machine and was supplied to the R.A.F. with the number XB833. With other Sabres it became surplus to R.A.F. requirements and was overhauled by Westland Aircraft, Ltd., and had U.S.A.F. markings painted on prior to delivery to a NATO air force. The serial number 19687 is its original R.C.A.F. serial.

France

Marcel Dassault Etendard IV. In tests at Mérignac this "multi-purpose fighter" with a single Atar turbojet is reported to have displayed exceptional qualities. The claim is advanced that it "takes off and lands within a smaller space than has yet been achieved by any jet plane." (The Etendard II is a light ground-support fighter with two Turboméca Gabizo turbojets, and the Orpheus-powered Etendard VI is intended for the NATO competition.)

Hurel-Dubois HD-32. Following an order for four HD-32s by the Institut Géographique National some months ago, the second order for the same number of machines has now been placed. Both HD-32 prototypes have now been re-engined with Wright 1,500 h.p. units and are now called HD-321.01 and 321.02. The prototype HD-31 is now in the hands of the Aéro Navale, and one HD-32 is with the French Air Force, undergoing utilisation trials.

S.O. Djinn. Military observers participating in recent tests near Chamonix have concluded that for mountain operations the Djinn helicopter does the work of 25 mules.

Sweden

Saab-91 Safir. The Royal Norwegian Air Force recently signed a contract for the supply of twenty-five Saab-91B2 Safir trainers, to be built at Linköping. The Norwegian Air Force is the third to adopt the Safir as its standard trainer: previously Sweden and Ethiopia had adopted the type. In civilian schools Safirs are used in Holland, Belgium, France, Western Germany and Indonesia.

East Germany

National Markings. The East German authorities announce that aircraft of the new East German Air Force will carry the territory's national colours—black, red and gold—in a square on the wings of its aircraft.

Egypt

Training Equipment. The semi-official Egyptian Middle East News Agency reports that henceforth the Egyptian Air Force will use only Russian Yak training aircraft. Harvards will not be employed after the next academic year at the Bilbeis school.

EDGAR PERCIVAL E.P.9
(Lycoming GO-480-B1B)
Span 43ft 6in
Length 30ft

Trade Show

RECENT WORK BY PHOTOGRAPHERS EMPLOYED IN THE INDUSTRY

BRISTOL TYPE 173 *E. K. Ashman*

GLOSTER JAVEL

Russell Adams

FOLLAND GNA

N FAW.4

Trade Show . . .

No branch of commerce is better served by its professional photographers than is the British aircraft industry. To the cameramen of the technical Press, of course, falls the primary task of keeping the nation's aircraft prominently in the eye of the world; but employed by a number of big manufacturers themselves, or offering their services to the industry as specialist free-lances, are operators of notable talent. Their skill—seldom proclaimed—is here bespoken by a collection of recent pictures. Their courage, in securing pictures such as that on the left, is best gauged—and is now acknowledged—by their colleagues of the Press.

Cyril Peckham

ARMSTRONG WHITWORTH (HAWKER) SEA HAWK FGA.6 *Alex Scott*

VICKERS-SUPERMARINE N.113 *Leslie Sansom*

Trade Show . . .

DE HAVILLAND COMET C.2 *G. I. Wheatley*

Forward end of a Bell HSL-1 anti-submarine helicopter.

BY HAROLD G. MARTIN

LAST year's report on the National Air Show, entitled "Off to Philadelphia" (*Flight*, September 16 and 23, 1955), began with the Associate Editor's choice adjectives, "Excommunication; banishment; deportation," the invoking of Paddy Leary's philosophy and the fervent hope that Philadelphia better be good. This year the assignment fell upon me, and he left me with only one adjective, *exile*, and the philosophy of Horace Greely, "Go West, young man," to draw upon.

I am extremely sorry I cannot report that in the going West I flew from Miami to Oklahoma City; my long experience in aircraft and airlines has taught me that you go by air when you've time to spare. As I wanted to be at the scene of the Show at least two days before it officially started, to get the best photographs* of the participating aircraft as they arrived, I gassed my Judson-supercharged Model 113 Volkswagen to capacity at 6 p.m. on August 27 and 32 hours later I was looking for accommodation in Oklahoma City, 1,578 miles distant. (In Texas the thermometer inside the VW touched 122 deg F; but that's another story.)

As it is each year, rehearsals were held during the two days preceding the actual start of the Air Show. These days are also utilized to the setting up of the indoor and outdoor static displays, seating arrangements for the public and—most important—the beverage-cooler in the working Press tent. They are also the best days for the photographers who haunt the taxi strips in hopes of getting clear views of the participating aircraft before they are cluttered with platforms and humanity.

The plan to permit sonic booms during the show was emphatically withdrawn after rehearsal "booming" had created a great deal of damage at the Will Rogers Airport terminal building, where windows and ceilings were shattered. Residents of Oklahoma City, too, were thrown into near panic; it was hinted that many, hearing the bangs for the first time, thought that an Indian uprising (with atomic weapons) was taking place. Calm was restored when local newspapers and radio stations assured the populace that sonic booms had been outlawed by the C.A.A. under the threat of cancelling the Air Show if the Military did not forbid its pilots to fly past Mach 1.

Three new trophies were announced this year. North American Aircraft, Douglas and McDonnell each offered to sponsor an event which featured their aircraft being used in a speed dash over yearly selected courses. Since the Navy could not find a way to bring one of its carriers into Oklahoma City (as they had been able to do at Philadelphia last year), they had the carrier *Shangri-La* cruising off the Pacific Coast from California to Oregon, launching aircraft for a dash for Oklahoma City each day. The first launch on the first day of the show (September 1) consisted of four FJ-3 Fury fighters of Navy Fighter Squadron 24, and two A3D-1 Skywarriors of Navy Heavy Attack Squadron 1, in a dash from the launching site just off San Diego to Oklahoma City, a distance of 1,195 statute miles. The winner of the North American trophy was Lt. (jg) D. K. Grosshuesch, who averaged 537.84 m.p.h. The A3D-1 Skywarriors of this first launch did not compete for the Douglas Trophy; out to illustrate the range and speed of the Skywarrior, they flew from the carrier to Oklahoma City and returned without refuelling.

**Some appeared in last week's issue; others are here—Ed.*

The second launch on the second day of the show was for the McDonnell Trophy. Four McDonnell F3H-2N Demon fighters from Navy Fighter Squadron 124 were on their way to Oklahoma City from somewhere off the California coast near San Francisco, a distance of 1,434 miles. Only two of the four arrived at Oklahoma City. The winner was Lt. (jg) Ralph Carson, whose average speed was 566.007 m.p.h. Four F2H-4 Banshee fighters were also launched on the second day, but they did not compete for the McDonnell Trophy. These four Banshees flew the entire distance in diamond formation and averaged 479.04 m.p.h. for the distance, which speaks fairly well for the Banshee's performance.

Third launch on the last day of the show (September 3) was of two Douglas A3D-1 Skywarriors, airborne off the coast of Oregon and flying 1,660 statute miles to Oklahoma City. The winner of this trophy was Captain J. T. Blackburn of Navy Heavy Attack Wing 1, who averaged 606.557 m.p.h. for the flight.

The Bendix Trophy Race was won this year by the Air Force's Capt. M. J. Fernandez, Jr. in a North American F-100C Super Sabre. The course was from George Air Force Base, California, to Oklahoma City, a distance of 1,120 miles, and it was covered by Fernandez at an average speed of 666.661 m.p.h. The record of last year's Bendix Race was 616.208 m.p.h., also set in an F-100C.

This year's General Electric Trophy race course was from Kindley A.F.B. in Bermuda to Oklahoma City, a distance of 1,900 miles, and the trophy was won by Capt. D. O. Peterson in a Boeing B-47E, which set a new record of 601.187 m.p.h. for the course. Other B-47s of Strategic Air Command made notable flights from far-off points on the globe. On September 1, three B-47Es arrived in Oklahoma City after flying non-stop from a base in England; and on September 3, another three arrived after a non-stop flight from a North African base.

The Allison Trophy is now awarded to winners of ground crews competing in the quick changing of Allison engines in F-80 and T-33 aircraft. This year's winners again came from Webb A.F.B. Texas, their time being 8 min 18.8 sec as against Webb's 1955 winning record of 11 min 32.2 sec. The winning team was led by S/Sgt. E. F. Bleckler.

This year the Thompson Trophy was awarded to the lone entry, Cdr. Robert W. ("Duke") Windsor, U.S.N., who flew the Chance Vought F8U-1 Crusader to a new national speed "record" of 1,015.428 m.p.h. over a 1,525 km high-altitude course near the Naval Ordnance Test Station, China Lake, California. It was strongly hinted that Cdr. Windsor was ordered, by the security hounds caged at the Pentagon, to hold the Crusaders speed to a fraction over 1,000 m.p.h.; but the American aircraft industry seemed to be satisfied that at last one production aircraft could be claimed to be able to fly at a speed slightly over the 1,000 m.p.h. mark.

All these trophy events must be recorded and reported, even though by this time they must be old hat to all interested parties. They are part of the yearly Show events and cannot be overlooked. However, the static and fly-by displays are by far the meatiest part of the shows and the ever-present rivalry between the U.S. military Services tends to make each year's displays more interesting. This time the indoor static displays were a slight disappointment to the group of perambulating perennials (scribes, photographers, *et al*), who missed "the solitary crazy Englishman" (those were the words *he* used in last year's Air Show report), as they watched the sun rise over Oklahoma on opening morning. All agreed there was little doubt he must be feeling kind of unhappy, sloshing about in the dew that fell on the Farnborough Show and that he would have given his last package of Sailors to be basking in the 90-degree dawn sunlight right there in Oklahoma.

The gates were opened to the public at 8.30 a.m., and as they swarmed into the display areas where the aircraft were parked one could see the awed looks on their faces as they beheld the size of some of the largest machines in the world. The big boys supplied by the Air Force this year included the Convair XC-99, Boeing KC-97G, Convair B-36H, Boeing B-47E-60-LM, Lockheed RC-121D, Fairchild C-123A, Lockheed C-131A and a spanking new Martin B-57E that someone had apparently placed amongst these giants just for the hell of it. The B-57E was new to most of us and we noted that it was the target tug version of the Canberra which we had heard was being built but had not seen before. It was painted a bright orange colour on topsides and bright silver underside; but except for the tow-cable tubes that extended from beneath the bomb bay to the rearmost part of the fuselage, the B-57E offered very little visible change. Also amongst these giants was parked the only two commercial aircraft displayed at

OUT IN OKLAHOMA

ATTENDING AMERICA'S NATIONAL AIR SHOW

the Show this year—a spanking new Aero Commander 680SC, neatly roped off so that ten-armed youngsters could not tear it apart. Beside it, also roped off, was a historical restoration (but not authentic) of a Lincoln Standard. I should like to report that the ropes held fast during the entire show and that both aircraft survived the ordeal very nicely.

On the north side of Will Rogers Field was another static display area, consisting of three indoor hangar exhibits, one each for the Army, Air Force and Navy. These Service displays were also identical with those shown in 1955, though only those few who had attended last year's event realized the fact (and none told). The outdoor static display consisted of a moored Navy Blimp Type ZSG-4, six types of missiles, thirteen types of helicopters and twenty-eight operational types of fixed-wing aircraft of all three Services. In this area, too, the Marines had set up their geodesic domes (largest size) to house their exhibits, which were likewise the same as last year except that inside one of the domes the clever "devils" had a North American FJ-3 Fury with its wings folded.

Notable types displayed in this area included a Cessna YH-41 helicopter in Army paint but with civil registration, a Northrop F-89H-10-NO with Falcon missiles and rockets in extended position, a McDonnell F3H-2 with under-wing Larks in place and a Vought F7U-3M with similar missiles in the racks. Perhaps the biggest surprise of all was the Northrop Snark lying in its launcher flanked by the older Martin TM-61 Matador. The Snark certainly was impressive. Its size when compared with the Matador is unbelievable, as are its very clear design lines. The entire North Area display could not be covered in less than three days. By the end of my third day in this area (two days before opening to the public and opening day) I would have given one of my best cameras to see the smiling face of that "solitary crazy Englishman" who plodded shoulder to shoulder with me at the Philadelphia show last year.

The playing of *The Star Spangled Banner* by the Phillips 66 Band (last year it was Stouffer's Band) at 12.30 each day marked the opening of official ceremonies, and if you were a spectator who had paid for a seat this meant that you had one half-hour before the flying display started in which to find what you'd paid for. Promptly at 1 p.m. the flying began with the Navy and Marines combining their craft in single-, two-, four-, eight- and twelve-unit formations and manœuvres that went on for 45 minutes. The aircraft were all permitted to fly at altitudes down to 300ft (many came down to 150ft) but the speeds were held to below Mach 1 on orders and threats of immediate show cancellation. Among the types in the Navy-Marine flight display were (in order of their appearance) four F3H-2 Demons, eight FJ-2 Marine Furies, four F9F-8 Cougars, four F7U-3 Cutlasses, four Marine F4D-1 Skyrays, one A3D-1 Skywarrior and one F3D-1 Skyhawk (making a formation take-off), one F8U-1 Crusader, twelve F9F-8 Cougars, two F4D-1 Marine Skyrays, four Marine F7U-3M Cutlasses, one Navy F9F-8P, one S2F-1 Tracker (take-off flanked by two hovering HSS-3 helicopters), two P5M-2 Marlins, one HS2L-1 anti-sub helicopter, one P2V-7 King Neptune, one F8U-1 Crusader in landing configuration, one TV-2 trainer (this ejected its rear seat with a dummy in place), eight Navy FJ-3 Furies and four Navy F4D-1 Skyhawks.

Two Marine HRS-3 helicopters lifted and transported a large geodesic dome, two F9F-8 Cougars dropped medical supplies in 'chuted containers, two HRS-3 Marine helicopters demonstrated air-to-air refuelling of helicopters, two Marine FJ-3 Furies and two Marine F7U-3M Cutlasses made arrested landings into a portable arresting gear. One Marine F4D-1 demonstrated "over the shoulder" atomic-delivery attack (complete with a detonated "Little Peachy"); eight Marine FJ-3 Furies, four Marine F4D-1 Skyrays and twelve Navy F9F-8 Cougars combined in a strafing and rocket attack; four Marine HRS-4 helicopters brought in ground troops, one HOE-1 Navy ramjet-tipped helicopter performed and eight FJ-3 and F4D-1 Marine craft dive-bombed.

A parade of Navy training aircraft came next with a fly-by of one T-34, one T-28C, one TT-1 (a new Temco trainer), one TV-2 and one F9F-8T. The Navy-Marine part of the Air Show was ended with the appearance of the Blue Angels flying F9F-8 Cougars. Their performance this year was by far the best they had ever done, but it was hopelessly outclassed when compared to the Air Force Thunderbirds in their new Super Sabres. If the Angels hope to continue their fine performances they will have to be provided with more modern aircraft than the Cougars they are now using. It was hinted that they would be getting Douglas F4D-1s or even the newer Douglas F5D-1s or Chance Vought F8U-1s—despite the Angels' tradition of using Grumman aircraft, for it seems that the Grumman "bag of cats" is empty.

A 15-minute intermission followed the appearance of the Blue Angels, and during this time the Phillips 66 Orchestra played spasms of popular tunes while prominent guests were introduced to the crowd. Movie star James Stewart put in his appearance and guest-announced most of the S.A.C. part in the flying display. Jimmy also professed his undying love for the *Boeing* B-36 whenever he could.

The Air Force had planned to open their part of the Air Show with eight Super Sabres producing a sonic boom as they swept over the airfield in single file; but in view of the ban they had to content themselves and the crowd by substituting a loud bang with fireworks. On the following two days the lead aircraft managed to slip a boom into the programme, but the seven following aircraft carefully stayed within the subsonic range and the lone report was overlooked by the officials.

The flying display put forth by the Air Force this year was much the same as in 1955 at Philadelphia, but they managed to have more of all types in the air. The Lockheed F-104A Starfighter was the only entirely new aircraft to be included, a pair of them being based at Tinker A.F.B. 20 miles away, under guard so that newsmen and photographers could not get near them.

Opening the Air Force contribution were the aforementioned

The ZSG-4 blimp and the Cessna T-37 jet trainer.

A Sikorsky H-34 of the U.S. Army.

Outsize stores on a Douglas Skyraider of the U.S. Navy.

Out of the past—the modified Lincoln-Standard.

One of the newly introduced Continental gas turbine/compressor units.

OUT IN OKLAHOMA . . .

eight Super Sabres, whose pilots managed to perform various manœuvres for the first six minutes, after which a lone Lockheed RC-121C flew towards the stands at 300ft to exhibit its "warts" to the throngs. This craft was supposed to have sent an alert that it had picked up an unidentified aircraft on its radar screens. A loud siren went off and two Convair F-102As were hastily scrambled to intercept. On the first and second days of the show only one F-102A managed to get airborne; the second dropped out whilst taxying to take-off position and retired to a far-off corner of the airfield for adjustments. On the final day of the show, both aircraft got off the ground on receiving the scramble signal.

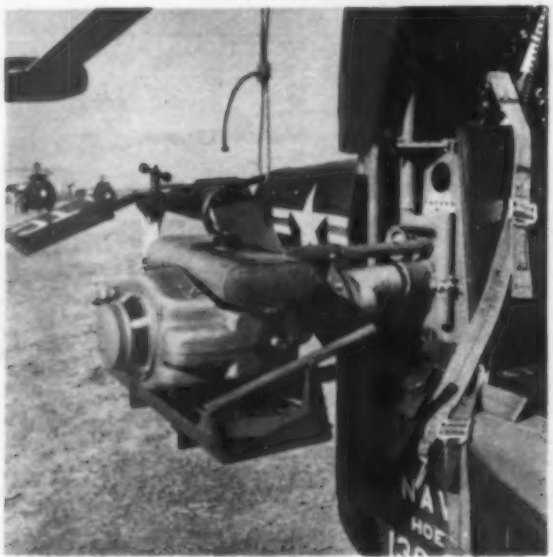
Next, nine F-86D Sabres flew past in flights of three, executing fan-outs while lighting up their afterburners and climbing out of sight. They were followed by nine F-89D Scorpions and nine F-94C Starfires, repeating the fan-outs and afterburner climb. The F-102A that had responded to the "scramble" several minutes earlier now came into sight with its gear down and drogue chute extended and proceeded to make a good landing in front of the stands.

As soon as the F-102A had cleared the active runway a single B-47E made a JATO take-off, using only a bracket of ten bottles on the assist (30 bottles can be rigged in a B-47). The smoke was still thick on the field when a flight of six B-36H bombers droned slowly overhead, to be followed by a flight of eighteen Boeing B-47Es in flights of three. These in turn were paced by a flight of three B-52Bs belching black sooty smoke from twenty-four J57 engines.

A flight of three Boeing KC-97G tankers with three B-47Es coupled to their refuelling booms came next, and as they passed over the edge of the field a B-47E with gear down and drogue chute extended touched down on the runway, popping its larger braking chute to show the spectators that a large B-47 could be landed in a small field. As the B-47E was taxying to the parking area a flight of Douglas B-66B craft flew in to demonstrate a low-level bombing attack, instantly followed by a flight of twelve F-84F Thunderstreaks in flights of four, finger formation, simulating a low-level strike, then pulling up to 3,000ft to provide cover for the next twelve F-100Cs, who took up the strike where the F-84Fs had left off.

The Super Sabres climbed to join the orbiting F-84Fs while a flight of eighteen TAC C-119Gs simulated a re-supply mission and three C-130A Hercules paratroop transports performed a paradrop of troops.

Starting motor of the Hiller H-32 ramjet helicopter.



As the C-119s and C-130As passed from view, the orbiting F-84Fs and F-100Cs regrouped into their original formations and streaked for their home base. In their places came three McDonnell F-101As, followed by six Convair F-102As and two Lockheed F-104A Starfighters flying just below the transonic range, the "Centurys" made a fast circle of the field and came over the stands, once more lighting their afterburners as they pointed their noses skyward.

This huge flying display of aircraft took almost an hour to complete, and several more events were yet to come. The Air Force cleverly inserted the Thunderbirds team at this point, and for the next 15 minutes everyone was thrilled with the way they performed with their new Super Sabres. Not once did the four aircraft leave the confines of the field during their demonstration (this had been the weak spot of the Blue Angels' demonstration—they were seldom in sight after executing a manœuvre). The Thunderbirds used their afterburners continually, cutting them in and out. The solo performer dashed in front of the spectators in a knife-edge pass at about 50ft, cutting his afterburner in and out; then he suddenly pulled the most sensational manœuvre I have ever seen: one fleeting moment he was headed in a northerly direction at terrific speed, with one wing-tip almost dragging the field and his afterburner popping on and off like a six shooter . . . and the next thing we knew he was flying west. In the time it took to flick an eye, he had executed a 90-deg turn, absolutely a square turn—without loss of speed or any mushing on the part of the Super Sabre. The first time it was done most of the "perennials" didn't believe it, so we made a special point of carefully watching on the following days; it happened just as I have recorded it above—an amazing and entirely new evolution.

The Thunderbirds ended their performance with their now-famous vertical climb and split to the cardinal points, returning in a vertical dive and pulling out to meet almost head-on in front of the spectators at deck-level altitude. After completing this evolution they were permitted to land on the runway nearest the spectators, who were thrilled at being able to witness the "greasing on" of the fast-landing Super Sabre.

The entire Air Force flying display was brought to a close each day with the fly-by of a lone B-52B bomber flanked on all sides by an assortment of "Century" fighters which included three F-100Cs, three F-101As, three F-102As and two F-104As.

After a 15-minute intermission and the awarding of trophies to the winners of the competitive events, the U.S. Army flying display started its 45-minute schedule, commencing with the appearance of twelve helicopters—four each of the H-13G, H-34B and H-21B. The leading Bell H-13Gs towed banners with the legend, "Army Aviation . . . Above the Best." This was followed by a formation of one of every Army operational fixed-wing and rotary-wing type, with the fixed-wing machines breaking off and landing in the grass area in front of the stands, while the helicopters kept on to their staging area so that they could take part in some of the later events.

Ground crews now hurriedly erected a 50ft-high rope-and-pole barrier, and the liaison aircraft (an L-19B, L-20A, U-1A and L-23) each performed a short take-off and cleared the barrier with ease. The most outstanding performer in this event was the de Havilland U-1A Otter; it could have cleared a 100-ft obstacle with ease. Next came the in-flight refuelling demonstration between a Vertol H-21B helicopter and a de Havilland U-1A tanker; this was the first time this type of operation was seen publicly.

Bozo the Clown again made his appearance this year, in the guise of a Bell H-13G flown by Chief W/O. E. A. Bourne. His bag of tricks were as amusing as before, and he had added a new one—a huge yo-yo top (attached to one landing skid) which Bozo worked up and down the string with amazing dexterity. As the clown took his bows the helicopter square-dance team appeared. This year they were flying Sikorsky H-19Bs in place of the Bell H-13s. The caller, Chief W/O. V. K. Schug, arrived to the scene

in a skittish, noisy Hiller YH-32 ramjet-tipped helicopter and this unbelievable dance started.

At the end of the dance a "Little Peachy" simulated atomic detonation was fired, to signal a ground assault by Army troops. Pathfinder teams were landed from two H-19B helicopters and infantry assault troops were rushed in *via* H-21Bs; as the battle grew in intensity a flight of four H-34B helicopters arrived on the scene of battle with 106 mm recoilless rifles slung underside. The 106s were quickly spotted and detached from their slings; then, as the H-34s moved out of the battle area, three L-19Cs came in low and dropped supplies by parachute, while another L-19C made a message pick-up from the troops on the ground.

Three L-20As and three U-1As came over next, a flood of multi-coloured parachutes of all sizes filling the scene. The L-19C that had been used to pick up the troops' message suddenly puffed smoke from its engine and hurriedly made a dead stick landing in the battle zone (this was a simulated "hit"). A flight of four Bell H-13Gs darted in to the area and made hurried medical evacuations, and while all this was going on four H-34Bs somehow got into the scene of smoke, whirling rotor blades and falling supplies and unslung four 75 mm pack howitzers for the troops. Just why falling splintered rotor blades were not also part of the demonstration is difficult to figure out. It seemed that with all this concentrated activity over one small area that a mid-air collision just had to happen; but it went off smoothly, and to everyone's surprise still more craft arrived on the scene. A small L-19C came darting at sagebrush-height, trailing communication wires, and four more H-34Bs arrived with quarter-ton jeeps in slings, unloading the vehicles in a twinkling. Gradually the tempo decreased and it was recognized that the battle was about over. The helicopters were thinning out and the din was subsiding. Then another H-34B appeared, with a mass of cables trailing. It hovered over the "wounded" L-19C that had dead-sticked in previously, and in a matter of seconds men were swarming over the L-19, which suddenly seemed to come to life. As the H-34B started to rise and move forward slowly we saw that this was an aerial evacuation of the complete L-19—a very neat trick at that.

The Army demonstration seemed to end as quickly as it had started. Three Bell H-13Gs moved slowly into view of the spectators, with display banners which read, "That's All, Folks." The time was now a few minutes past 5 p.m. The entire demonstration had consumed slightly over four hours and the "perennials" (minus the lone, crazy Englishman) suddenly realized that they were hot, dry and footsore. No one had to suggest that we head for the beverage-cooler in the Press tent. The most common opinion was, "Next year I'm going to stay at home, I'm getting too old for this rugged deal." But on the final day, when the show was over, the good-byes all included those famous last words: "See you next year." And I am sure that everyone meant it.

FOOTNOTE: It may be added that during the show the U.S. Army set a helicopter endurance record of 57 hr 45 min in a Bell YH-13H (makers' Model 47G with Lycoming O-435-21 engine).

The Douglas YA3D-1 used in the formation take-off demonstration with the YA4D-1 in the Navy part of the show, crashed to destruction (no fatalities) when it lost an engine—due to flame-out—on take-off after the show was over and the craft was returning to its home base, Albequerque, New Mexico.

Jet intake and outlet of Temco TT-1 trainer

Fly-by of three Lockheed C-130 Hercules turboprop transports.

A light carrier-borne attack machine, the Douglas YA4D-1.

The new Cessna YH-41 (commercial designation CH-1).

The heaviest carrier-borne aircraft—a Douglas A3D-1 Skywarrior.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Air Chief Marshal Sir Alec Coryton presents a Standard to No. 31 Sqn. at Laarbruch, Germany. The Standard Bearer is F/O. E. Davies. Commanding Officer of the squadron is S/L. J. C. Stead.

Exercise "Stronghold"

THIS year's major air defence exercise, which is now drawing to a close, was principally designed to test the air defence of the United Kingdom and afford an opportunity for practice. Although similar in conception to last year's exercise "Beware," "Stronghold" saw the introduction of no major new techniques. There was no background story to set the scene and Fighter Command's task was simply to intercept as great a proportion as possible of the raids put up by various commands and air forces. There were two phases instead of the usual three, the first one lasting from 0100 hr last Friday until Sunday afternoon, and the second from 0100 hr on Wednesday until tonight.

At a preliminary Press conference last week at H.Q. Fighter Command, the A.O.C-in-C., Air Marshal Sir Thomas Pike, explained that the first phase was a purely domestic exercise with the object of giving the regular defences practice against a variety of raiding aircraft provided by Bomber and Flying Training Commands, the Fleet Air Arm, and by some units of the Continental air forces and of the U.S.A.F. in the United Kingdom. Since the emphasis was on countering a surprise air attack, no special steps were taken to warn or call up reservists and the Royal Auxiliary Air Force. Because of the keenness of the latter, a good Auxiliary turn-out was nevertheless expected.

During the second phase "Stronghold" would be co-ordinated with "Whipsaw," a large NATO air exercise under the direction of SACEUR. By virtue of this fact the variety and origin of raiders would be hard to foretell and would give the battle-order intelligence organizations an interesting task. Raiders flying between England and the Continent would be intercepted by both NATO and R.A.F. fighters. The C-in-C. made it clear that this co-operation with SACEUR in no way affected Fighter Command's commitment to the defence of the British Isles, either during "Stronghold" or in any conflict. A further exercise during the first phase of "Stronghold" would be "Outward Bound," a Royal Observer Corps exercise providing first experience of the new task of radio-active fall-out plotting and reporting.

Unfortunately, continued the Air Marshal, neither Javelins nor V-bombers were expected to take part in "Stronghold" in any numbers. [Some Valiants were in fact intercepted and two Javelins claimed the surprising total of five kills in ten minutes at night during phase one.] Otherwise No. 46 Sqn., the only Javelin unit, was still engaged on intensive flying trials which would last for about six weeks more. These, said Sir Thomas, had to be given priority. The V-bombers could not be committed to a period of intensive activity when their services might be needed elsewhere.

As it turned out, the major proportion of raiders in Phase 1 appear to have been fighters simulating bombers; and some of these came from Fighter Command itself.

New equipment in "Stronghold" consisted mainly of a type of radar which has just been introduced and which apparently gives remarkably good results. In addition, a part of the control and reporting ground network had been set aside for trials of the new automatic high-speed plotting system. The new radar gave better "visibility" over considerably increased ranges.

After explaining the layout of the exercise, at the conference referred to above, Air Marshal Sir Thomas Pike was questioned in some detail as to why Javelins were not taking part in the exercise and whether raiders would be operating at realistic heights and speeds.

The Javelin, he replied, had gained a bad reputation which was rather unjustified. The type was in fact doing far better in service than the Hunter had done at an equivalent stage in its introduction. Having returned the previous day from a visit to No. 46 Sqn. at Odiham, he could report that the aircrews were extremely pleased with the Javelin. There were one or two snags, such as starter cartridges exploding and blowing a hole in the bottom of the fuselage, and air-brakes freezing up in the extended position. Remedies for these defects were already in hand. But the crews reported that they were very happy with the A.I. gear, both with its range performance and lock-on.

On the score of engines, said Sir Thomas, there was no difficulty. The Sapphire, which was almost the same as that of the Hunter 5, had given no trouble. In any case, the Javelin's single-engined handling was absolutely straightforward. Pilots felt that the aircraft was as good as, if not better than the Hunter on the score of performance; it had the same rate of climb, the same top speed and could turn inside a Hunter in most conditions. Gun-firing had given no trouble. Guided weapons were not yet being carried. In view of this state of affairs, Sir Thomas wondered what all the fuss was about. But it was true that both Hunter and Javelin were late—by a matter of years, not months. He could state categorically, however, that the R.A.F.'s V-bombers were better than any other bomber in the world and that both Hunter and Javelin could shoot them down.

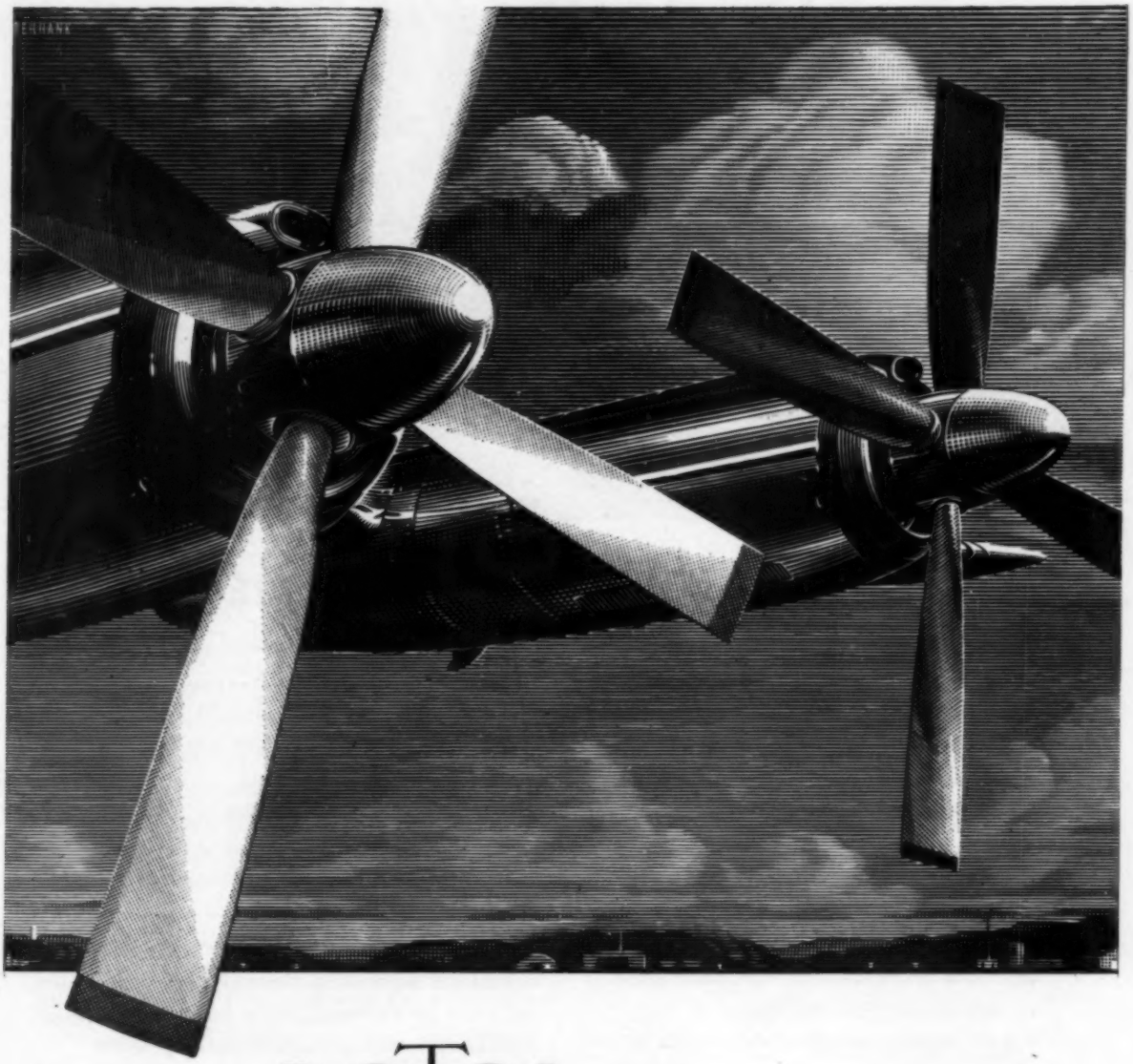
In reply to a question about missiles, the C-in-C. stated that no air-to-air guided missiles were in service in any country. Asked immediately about the Hughes Falcon and Sperry Sparrow in U.S.A.F. and U.S. Navy squadrons, he pointed out that the Hughes Falcon relied for success on a direct hit. Without some kind of proximity fusing it was not acceptable by R.A.F. standards. Fireflash, he added, would not go into R.A.F. squadron service and would not be fitted to R.A.F. Hunters. It had a limited capability and, since finances were far from unlimited, the Service had decided to go straight for the more advanced weapon which would shortly be available. No details of this were yet released. Swifts had been converted for Fireflash operational trials mainly because a number of them had in any case to be bought and the airframe was conveniently available.

The Hunter was now established in squadron service in large numbers and, though there was still a backlog of modifications to be carried out on some aircraft, the type was satisfactory and now free from gun-firing and other difficulties. Results after over a year in squadron service were most encouraging and the accident rate had been less than half that which had been expected. It took about a year to work the snags out of a new type in service despite all preliminary testing.

Sir Thomas gave some indication of the lines along which air defence might develop in the future. He referred to radar employing the forward-scatter principle, which might lead to radar sets having ranges of between 250 and 300 miles and between 900 and 1,000 miles. Asked when the manned fighter could be expected to be replaced by ground-to-air guided weapons, he said that there was a definite and continuing need for manned fighters. The P.1 would be able to reach Mach 2 during its life, but a manned fighter with Mach 2-3 capability was a definite requirement—in order to cope with stand-off bombing, and because we could not afford not to have a defence against manned bombers. The pilot would continue to provide a flexibility of operation which was invaluable. Ground-to-air missiles would be introduced for target defence, but they were in the nature of a second string. Manned fighters would also be required as a highly mobile stand-by for the missiles.

The First Phase.—The first phase of "Stronghold" took much the same form as similar phases of previous exercises. On the fighter airfields it was a case of standing by for long periods until the local situation justified the longed-for scramble. Then the cry was for height and speed and, under the guidance of the ever-watchful G.C.I., a rush in to "clobber" the designated target. The pulse-like alternation of frenzied activity and seemingly endless inertia was maintained as the air battle flowed and ebbed around the coasts. By Saturday morning the Auxiliary squadrons had brought their ageing Meteors into effective contact with a variety of aircraft, and the summery stratosphere became criss-crossed with scores of vapour trails.

It transpired in Phase 1 that some Hunters had tangled with F-100 Super Sabres from Holland. According to an Air Ministry spokesman the Hunters in all cases claimed to have shot down the F-100s. Other Air Ministry sources admitted that the F-100s were flying at reduced speed, presumably at their long-range ferrying speed of Mach 0.86. By using its level-speed capabilities alone the F-100 could show a Hunter a very clean set of afterburner eyelids.



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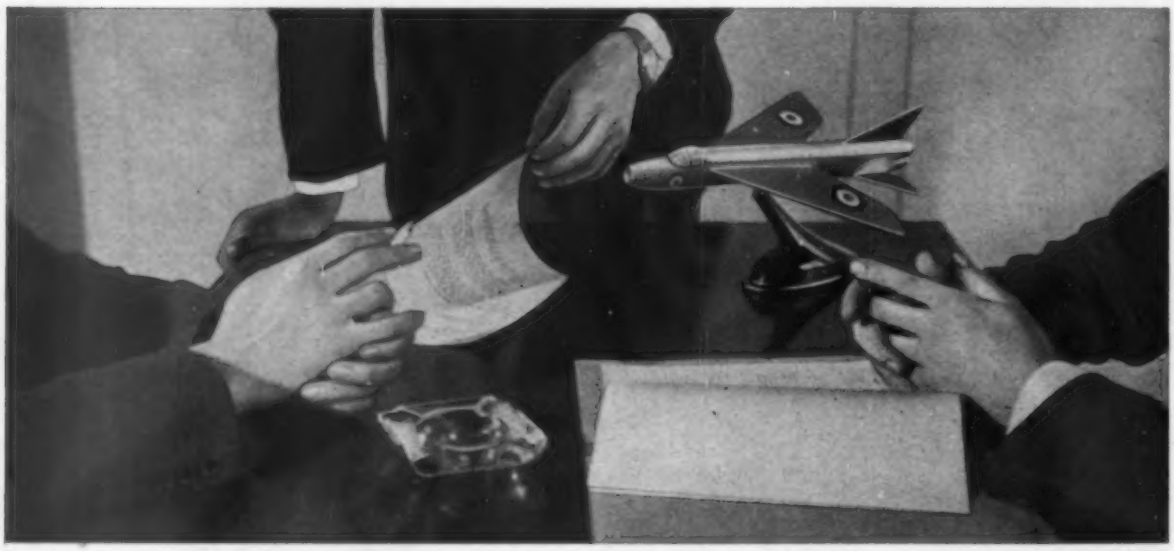

'...but our most urgent need is—MORE STAFF'

(Report of a meeting between the Chief Engineer, his Technical Assistant and his Personnel Officer)

C.E. As I see it, the problem is how to attract people by conveying some idea of our future plans without giving away secret information.

P.O. Haven't we first got to convince them that ENGLISH ELECTRIC intend to push ahead with the next generation of aircraft?

C.E. Surely they don't think that after all the work we've done on supersonic flight in general, and the P.1. in particular, we are just going to sit back and go out of business!

P.O. If we can't talk about the aircraft we are planning to build can we say something about the equipment we've got or are going to get?

T.A. For example, is it permissible to point out that our new tunnel has been designed for speeds up to Mach 4, and let people draw their own conclusions?

C.E. There's no reason why we shouldn't. And we can mention the new plant for testing structures and equipment at high temperatures non-stop for hours at a time. In fact we ought to talk about all our test installations.

P.O. Provided we don't thereby give people the impression that we are a great octopus in which the individual is swallowed up.

T.A. I've never yet heard a research man complain about the amount of equipment or the size of the resources at his disposal!

C.E. True, but it's worth pointing out that this Division is a self-contained affair of very reasonable size, with a colossal parent organisation behind it.

P.O. Which of course brings in all the other advantages like security of employment, opportunity for advancement, decent working conditions and help with the accommodation problem.

C.E. And remember we want all grades of D.O. and engineering staff—mechanical and hydraulic engineers, heat-transfer experts, metallurgists, physicists, aero-dynamics folk—the lot. We must look outside the aviation industry as well as inside. See if you can get something on paper for me.

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CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns; the names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Low-altitude Contrails

WITH reference to Mr. T. P. de Paravicini's profound letter on contrails (*Flight*, September 14) I wish to confirm his statement that they can be formed at low altitude.

I saw, one bitterly cold Sunday morning early in May 1937 or 8, three Hawker Hinds flying at about 800ft leaving black pencil contrails which hung in the air for miles or at least a minute and a half. However, on this particular morning, and for some days previously, conditions were rather peculiar. Apart from the intense cold the clouds, although without definite form, appeared to be polished like metal and the east wind was so dry that it cracked the lips and corners of one's mouth. No doubt the met. experts could explain this condition.

During the war I saw a Lancaster leaving a similar black contrail from the tail at about 1,500ft. In this instance the day was humid. Three or more aircraft were milling round this Lancaster which, as events turned out, may have been an early test bed with a jet installed in the tail.

I have seen a curved contrail above which, against thin alto-stratus, there proceeded a *straight* black shadow. The contrail came directly from out of the sun, and provided the plane did not gain or lose altitude when turning to port (or starboard) this phenomenon is quite in order, for it has also been seen by many other people.

Also last year, I saw a high altitude contrail with a great kink in it. Have any other readers seen these variations?

Birmingham, 14. MAURICE AUSTIN.

Nationalized Airways

IT is refreshing to see that instead of continuing to lose the taxpayer's money, British European Airways have at last made a respectable profit, although it is still very meagre when expressed as a percentage on their turnover.

But can anyone explain why we must have *two* nationalized air corporations? I personally feel that private enterprise can always do better, as in overseas airlines, and as borne out by the recent results of British Aviation Services, which includes Silver City Airways.

In case anyone points out that B.O.A.C. do all the long runs, and B.E.A. all the short hauls, and therefore the respective aircraft used are quite different, etc., etc., I would point out that the railways of this country are all under one authority, and not two separate corporations, one running long distance express services and the other "locals."

Last year B.O.A.C. handled a third of a million passengers with approximately 18,000 total staff, yet a prominent North American airline handled no less than *seven* times that number of passengers with actually fewer staff.

On top of this seeming inefficiency, we have duplicated staff, ground crews, maintenance men, etc., in B.E.A. who could very well be telescoped in a merger between the two nationalized airlines.

Sutton Coldfield, Warwicks. NOSWALE.

Automatic Pilots

WE have noted with interest the comments of Mr. K. I. T. Richardson, superintendent of publicity services, Sperry Gyroscope Co., Ltd., which appeared in your issue of July 20. Referring to our advertisement in the May 1956 issue of *Aviation Age*, Mr. Richardson stated he was "slightly amused by [the] claims in the FTR advertisement." Mr. Richardson implied that Sperry's AL1A and AL3 Gyropilots preceded Federal's tubeless autopilots. Information available to the writer discloses that the AL1A Gyropilot employs air-driven gyro and pneumatic servos; and the AL3 Gyropilot *does* employ vacuum tubes, which is contrary to Mr. Richardson's statement in his letter.

Truthfully, the early hydraulic automatic pilots were the first "tubeless" autopilots. With the advent of electric autopilots which utilized vacuum tubes for power amplification, phase detection, etc., the term "tubeless" has been applied to those electric autopilots which functioned without the use of vacuum tubes. In the case of Sperry's AL1A Gyropilot, which utilizes pneumatic servos rather than electric, we believe your readers will agree with us that it is not truly a "tubeless" autopilot in the sense that the term, as used throughout the industry, implies. The fact that the AL3 *does* employ tubes speaks for itself.

Unlike Mr. Richardson, who found himself "slightly amused" at the claims Federal made for its autopilot in the *Aviation Age* advertisement, we find we are not amused (even slightly) by what he has endeavoured to convey to your readers. Two statements in his letter have us chortling, however:—

"The Sperry Gyropilots employ well proven gyro references." Federal's F-200 and F-300 Autopilots use vertical gyros of Sperry Gyroscope design. Many thousands of these gyroscopes have been manufactured in the United States by Sperry and other manufacturers. They have been successfully used by civil and military aircraft.

Referring to Federal's claim for the "only tubeless" pilot at the "lowest price" and "first in its field" (for aircraft under 7,500 pounds gross take-off weight), Mr. Richardson states: "All these features we can, I believe, justifiably claim for the Sperry Gyropilots, if we wished to." Knowing how vigorously public relations people bring new or advanced philosophies and equipment to the attention of the general public, we can assume that Mr. Richardson knows that the claims contained in his referenced letter are not valid.

We trust that the foregoing puts the true perspective for your readers. PAUL HARVEY,

Clifton, N.J. Export Sales Manager, Federal Telephone and Radio Co.

From the R.N.Z.A.F. in Fiji

WITH reference to the photograph in *Flight* of May 18, 1956, page 629, the Sunderlands shown are captioned, "Sunderlands of 205/209 Sqn." This may be correct in the case of the trail aircraft, but is certainly not so in the case of the lead aircraft illustrated. This Sunderland is, without question, a Sunderland of the R.N.Z.A.F. and belongs to either No. 5 or No. 6 Squadron.

With a little more detail, we might be able to furnish the number and hull letters of the aircraft. From photographs taken during the same flight, I believe we are right in saying that it is NZ.4117, with hull letters KNK. As proof of this disclaimer, the aircraft in the lead has twin A.D.F. loop housings and twin radio aerial kingposts. Also, although they are far from plain in the photograph, NZ.4117 had exhaust fishtails removed.

In closing, let us thank you for the subject. It provided a very interesting discussion. PRIDE OF PLACE

Suva, Fiji. (The Men of No. 5 Sqn., Fiji.)

[The caption in question was from an official source.—Ed.]

Veteran Skymaster

YOUR correspondent Sgt. D. F. Gilpin referred in your issue of April 6, 1956, to a veteran Skymaster, serial No. 3094. This veteran is still a master of the sky, having been re-christened under an Indian registration mark VT-DIA in September, 1955. As a close companion to five other Skymasters of the giant nationalized airline, the Indian Airlines Corporation, this aircraft is principally engaged as one of the night air mail runners for the Indian Government. Occasionally the veteran can be seen at British and European airports, carrying distinguished passengers. With an age record of 22,900 flying hours VT-DIA is still a youthfully vigorous performer in the aviation sky.

New Delhi. INDIAN AIRLINES CORPORATION,
Someshwar Dayal, Chief Public Relations Officer.

FORTHCOMING EVENTS

Sept. 25-29. 2nd European Aeronautical Congress, Scheveningen.
Sept. 27-28. Aerodrome Owners' Association: Annual Conference, Southampton.
Sept. 28. R.Ae.S.: Graduates and Students Section: "Novel Methods of Take-off and Landing," by T. J. Cummings.
Oct. 1. R.Ae.S.: First Sir Henry Royce Memorial Lecture, by H. I. F. Evernden. M.B.E. (Main lecture at Derby.)
Oct. 4-5. Air Traffic Control Convention, Southend.
Oct. 5. Helicopter Association: "Strain Gauge and Blade Motion Recording Systems for Helicopters," by P. D. MacMahon.
Oct. 6. British Interplanetary Society: "Study of the High Atmosphere in the International Geophysical Year," by Prof. H. S. W. Massey, F.R.S.
Oct. 9. R.Ae.S.: Section Lecture: "The Pressure Jet Helicopter," by A. Stepan, Dipl.-Ing.
Oct. 10. R.Ae.S.: Graduates and Students Section: "Service Flight-testing of High-speed Aircraft," by S/L. P. D. Thorne.
Oct. 11. R.Ae.S.: Main Lecture at Henlow: "Rocket Motors," by S. Allen, F.R.Ae.S.
Oct. 16. Institute of Navigation: A.G.M. and Presidential Address: "The Place of Navigation in Modern Air Transport," by Captain A. M. A. Majendie.
Oct. 17. R.Ae.S.: Main Lecture: "Importance of Time in Aircraft Manufacture," by A.Cdre F. R. Banks, C.B., O.B.E., F.R.Ae.S.
Oct. 23. R.Ae.S.: Section Discussion: "Functional Efficiency of Aircraft," introduced by C. Abell, O.B.E., F.R.Ae.S., and A. V-M. A. F. Hutton, C.B., C.B.E., D.F.C.
Oct. 25-26. Aircraft Electrical Society: Annual Display, Los Angeles.

R.Ae.S. Branch Fixtures (to October 22):
Oct. 1, *Derby*, Main Lecture (see above). Oct. 2, *Boscombe Down*, "Meteorological Flight Research," by R. J. Murgatroyd. Oct. 10, *Luton*, "The A.R.A. Transonic Tunnels," by A. B. Haines. Oct. 11, *Henlow*, Main Lecture (see above). Oct. 17, *Coventry*, "Problems Associated with Production and Use of Wrought Aluminium Alloys," by G. Forrest and K. Gunn. Oct. 22, *Glasgow*, "Development of the Jet Propulsion Gas Turbine," by G. C. R. Mathieson.

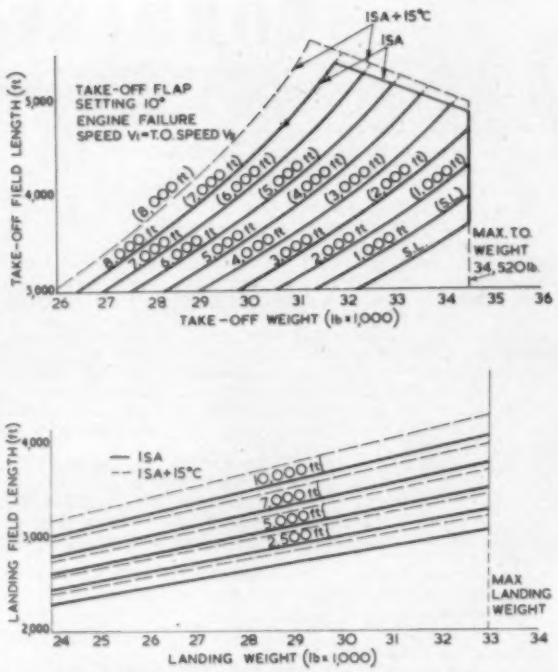
The Friendship's Field Performance

ON the eve of publication of the Commercial Aircraft Number of *Flight* (July 6) we received and were able to include in our explanatory notes some information relating to greatly improved take-off and landing performance figures for the Fokker Friendship. To the operator beset by terrain difficulties, Fokker suggest that the reduced field lengths required—about 90 per cent of the previous estimates—could be decisive where new equipment decisions are being made and might bring the aircraft within the consideration of the range of companies who could not previously contemplate the use of a fast modern turboprop. The airfield performance of the 32-seat Friendship at maximum landing and take-off weight compares very favourably with the 24-seat DC-3 which it has, in part, been designed to replace. Where the DC-3 required a field-length of 4,500ft to take off at full load, the F.27 will require a guaranteed length of only 3,850ft; similarly, the landing field length required is a guaranteed 3,000ft over the DC-3's 3,400ft.

Estimated take-off and landing performance curves are shown on this page. The calculations have been made on the basis of the American Civil Air Regulation requirements which for take-off assumes that the critical engine fails at the critical point in the take-off run, whereupon the airscrew automatically feathers. The altitude figures given in parenthesis relate in every case to take-off in hot-day conditions—those drawn show performance at international standard atmosphere plus 15 deg C—and include the use of water-methanol injection into the two Dart 511 turboprops. It may be seen from the graph for take-off field length that the estimated values for the maximum take-off weight of 34,520 lb and a demonstration weight of 33,000 lb are 3,640ft and 3,220ft respectively; while the new guaranteed field lengths at these weights are 3,850ft and 3,400ft.

The landing field length requirements shown on the graph are also drawn to C.A.R. requirements, which exclude the benefits of reversed thrust. The figures are given for the most forward centre of gravity position (24 per cent of the aerodynamic mean chord) and provision has again been made for the increased field lengths required with higher-than-standard temperatures. An interesting feature of the Friendship is that because tandem wheels are used the maximum mainwheel load of 8,100 lb is very much less than that of the DC-3. The mainwheel tyres are inflated to 79 lb/sq in and the nosewheel tyres to 61 lb/sq in, although optional pressures of 60 and 40 lb/sq in can be used.

The reason for the use of a collector tank in the Friendship fuel system—which has been the subject of speculation by some operators—has recently been explained by Fokker as being necessary to prevent flame-outs as a result of entrained air in the fuel. Unlike the piston engine, they say, the turboprop has no carburettor to bleed air from the fuel at the engine and the collector tank has been introduced to act as a separator—the released air is vented back to the main integral tanks. Aerated fuel, it is pointed out, can be caused by flying in bumpy conditions or during a side-slip, and in these conditions the trapped air may cause the supply to the collector tank to be interrupted.



Marked improvements in the take-off and landing field lengths previously quoted for the Friendship are shown in these new estimated performance curves, which are plotted to the requirements of Civil Air Regulations 4b. The sea level standard day take-off field length of 3,640ft at the maximum all-up weight of 34,520 lb is particularly noteworthy. Fokker's guaranteed field lengths are given in the text.

NEW U.S. AIRCRAFT ELECTRICAL EQUIPMENT

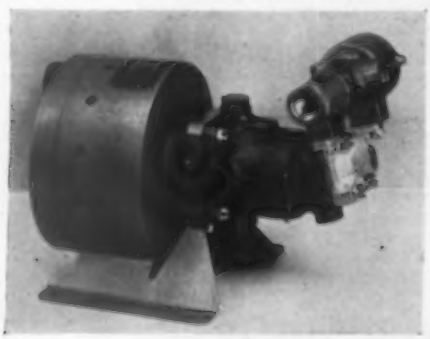
SIX sizes of hydraulic-powered electrical power packages ranging from 0.5 to 3.0 kVA output have been developed by Vickers Incorporated of Detroit, Michigan. The units are light and compact, and are claimed to show improved efficiency when used in place of a conventional inverter in providing A.C. power for new or additional systems. Typical applications are power supply for the co-pilot's instruments in multi-engined aircraft, or emergency A.C. power when the only power source is a ram-air-turbine hydraulic pump. Normally, power is supplied by the flow available in the aircraft hydraulic system—which is claimed to be made generally without any changes to the system—full flow is demanded only briefly and infrequently. (This conception makes an interesting comparison with the long-range versions of the Britannia, the Messier hydraulic pumps of which are driven electrically.)

The alternator is a 120/208-volt, three-phase, Y-connected unit generating at 400 cycles/sec at 8,000 r.p.m. It is capable of continuous operation between temperatures of −65 to +250 deg F, and, as there are no brushes, it can be used at altitudes up to 55,000ft. The reduced size and weight over conventional generators are obtained from elimination of the exciter and slip rings.

Performance data for the six Vickers models are as follows:—

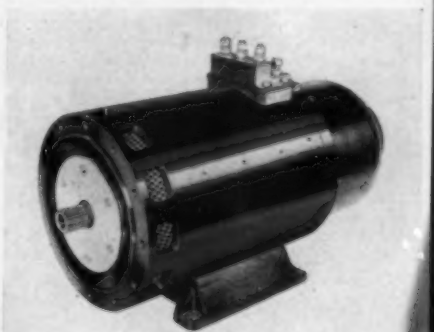
kVA	Duty cycle	Speed (r.p.m.)	Air pressure required (in of water)	Power factor
60	Continuous	5,700-6,300	None	.75
120	Continuous	4,000	6	.75
120	Continuous	4,800-7,200	6	.75
160	Continuous	5,700-6,300	11	.75
180	5 minutes	6,000	11	.75
240	5 seconds	6,000	11	.75

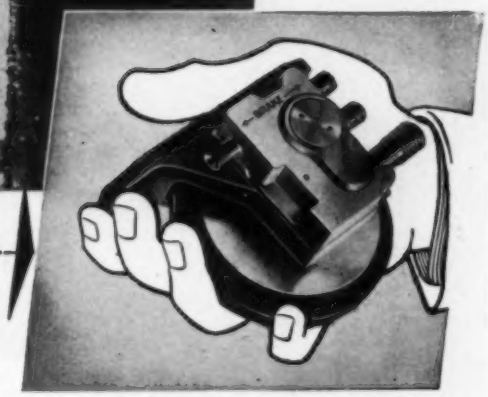
A much larger, very heavy duty machine is the G-180 160-kVA alternator manufactured by Jack and Heintz (who are, *inter alia*, responsible for the complete electric system of the Douglas DC-8). The power rating of 160 kVA is claimed to be the highest ever designed, but will make provision for aircraft requirements for the next few years, including nuclear-powered aircraft. Jack and Heintz say that the benefits derived from the use of a large single-source machine over a multi-generator installation—the elimination of components and complexity with a reduction in weight—make it attractive for today's multi-engined aircraft.



(Left) Driven by a Vickers constant-speed oil-hydraulic motor, this 1-kVA generator meets electrical power requirements for aircraft instruments or emergency use.

(Right) The Jack and Heintz 160-kVA generator can be driven directly, by constant-speed drive, or by gas or air turbine.





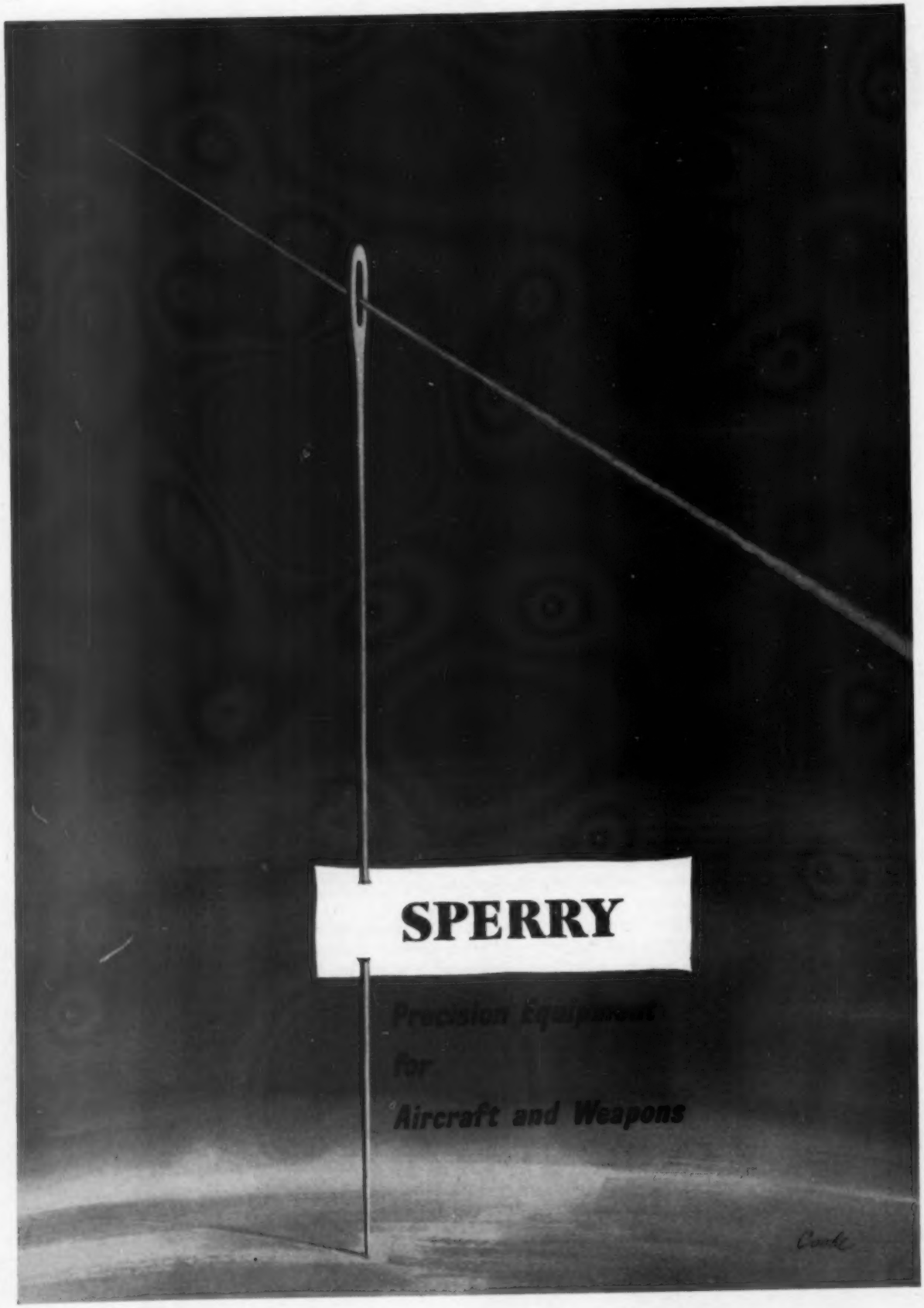
---- THIS IS THE WAY TO STOP THEM!---

These runway skid marks, hundreds of yards long, are evidence of the destruction of four first-class aero tyres. Had the *aircraft that made them been fitted with Maxaret Anti-skid Units there would have been no skids and no tyre damage.*

The Maxaret, developed by Dunlop, is a device that keeps braking power at a constant maximum (with pilot-control right up to skidding-point) and totally prevents wheel skidding and tyre scrubbing damage. It enables the operator to get more landings per tyre and offers the pilot and passengers added security in emergency. The small, compact Unit, weighing only 4.7 lb., fits any size of wheel and makes no additional demands on aircraft services. Full details of the Maxaret are available from the Dunlop Aviation Division.

DUNLOP **MAXARET**
ANTI-SKID UNITS

DUNLOP RUBBER COMPANY LIMITED (AVIATION DIVISION) · FOLESHILL · COVENTRY


SPERRY
Precision Equipment
for
Aircraft and Weapons

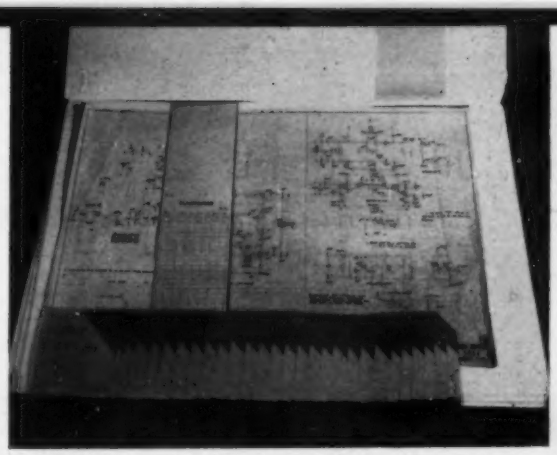
THE INDUSTRY

Quick-reference Drawing File

KEEPING blueprints, tracings, charts and other drawings flat and undamaged, and at the same time quickly accessible, often presents a problem. One solution, a compact filing system called "The Planfinder", has been devised by Steeldex, Ltd., 1 Castle Court, Birchin Lane, London, E.C.3.

The device has flexible covers and a wooden spine from which separator guides extend, each one lying slightly above its predecessor and being turned over at its outside edge to form a flap. The corner of each flap, cut off at an angle and reinforced with a special tab, can be marked with a letter or number for quick reference; and the guides allow blueprints or drawings to lie flat and to be withdrawn or replaced without difficulty.

The Planfinder is available in eight different models, varying in size and style, and can hold up to 50 drawings.



The "Planfinder," described at the top of column 1.

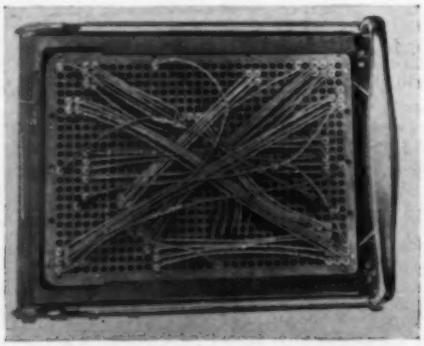
Solderless Terminal Applications

FROM Aircraft-Marine Products (Gt. Britain), Ltd., 60 Kingly Street, London, W.1, has come information on developments and new applications of A-MP solderless-type cable terminals, particularly in aircraft installations, where space and weight compel the use of miniature wiring components and where shock and vibration may be encountered.

According to a recent fully illustrated brochure published by the company, aircraft-type connections are now available with female halves to accommodate A-MP taper-pin wire ends, which eliminate time-consuming soldering operations. This type of tapered connection, it is stated, has passed U.S. military acceptance tests, under extreme conditions of vibration, mechanical and thermal shock, and corrosion.

In addition, computers and electronic devices can be further "miniaturized" by designing around the A-MP Patchcord programming system utilizing taper pins (see illustration).

Attachment of fittings to cable ends is by means of automatic machines or hand tools selected according to production requirements.



Aircraft-Marine Products' "Patchcord" system.

Versatile Angles

UNDOUBTEDLY the highlight of a gathering held last week at Bush House, London, by Dexion, Ltd., was a description by Dr. Vivian Fuchs of the programme to be followed in the exploration of the Antarctic by the British teams before the sun is lost to them on May 4 next year.

Dr. Fuchs said that stores deposited at Shackleton Base were already covered by 15ft drifts of snow and that the expedition would have to employ mine detectors to find them. Some 300 miles farther south, said Dr. Fuchs, a new base was to be built, and the stores there would be placed on scaffolding constructed of Dexion slotted angle girders. This system, he thought, would enable the drifting snow to blow through and past the stores and there would be no trouble in finding them again.

There is, however, no need to go to the Antarctic to find uses for this highly adaptable structural material. Almost every airfield and factory has a "cemetery" of old servicing platforms and jigs, which, had they been made of slotted angle, could have been re-erected for a different purpose instead of being discarded. Dexion slotted angle has also been used for jury-rigging a badly damaged aircraft into flying condition (see *Flight*, April 13, 1956).

IN BRIEF

The Air Navigation Development Board, which co-ordinates civil and military radio-navigational requirements in the United States, has placed an order for Cossor secondary-surveillance radar equipment, including ground station units and airborne transponders. This order will enable the A.N.D.B. to determine the methods whereby the Cossor sidelobe suppression system can be integrated with other radar techniques in their air traffic control network.

* * *

The British Welding Research Association is preparing a series of six booklets on the argon-arc welding of aluminium and its alloys. Part I, *The Principles of Argon-arc Welding Aluminium* (2s 6d, post free), and Part II, *Electrical Characteristics and Equipment for Argon-arc Welding Aluminium* (5s, post free), have already been published and may be obtained from the Association's offices at 29 Park Crescent, London, W.1.

* * *

In a review of accessory developments in our issue of August 31 reference was made to "one of the most unusual, and most elegant" solutions to the problem of accommodating undercarriage units within high-performance aircraft, i.e., the method employed in the English Electric P.1. It should be made clear that all P.1 undercarriages are, in fact, of British Messier manufacture.

* * *

A new Anglo-American company, Ketay, Ltd., has been formed for the production of precision synchros, servomotors, resolvers and tachometer generators for use in computers, radar sweep circuits, phase shifters and accurate data-transmission systems. The company is a joint one, formed by the Plessey Co. and the Norden-Ketay Corporation of New York; its offices are at Eddes House, Eastern Avenue, West Romford, Essex. Directors are Messrs. A. G. Clark, E. J. Earnshaw, and A. E. Underwood of Plessey, and Mr. Morris F. Ketay of Norden-Ketay.

Mr. W. A. Burnside, A.R.Ae.S., has been appointed sales manager for R. B. Pullin and Co., Ltd., Brentford, Middx., one of the Pullin Group of companies. Other news from Brentford is that a new member of the Group, Victoria Instruments, Ltd., Victoria Road, London, N.W.10, has taken over control of Victoria Instruments, formerly operated by V.I.C. (Bournemouth), Ltd.

* * *

Muirhead and Co., Ltd., Beckenham, Kent, announce that a range of precision test equipment, similar to that used in their own synchro test rooms, is now available. It is designed to perform the electrical accuracy and residual voltage tests specified in the U.S. Navy Bureau of Ordnance Specification MIL-S-16892, and in addition provides facilities for zeroing, transformation ratio measurements, and current and power measurements. Also available, for immediate delivery in limited quantities, are "super synchros Type 18CT4a" and Type 15TR4a.

Hydraulic power for the operation of "everything out and down" on the Chance Vought F8U-1 can be provided by the ram-air turbine seen extended from its hatch below the leading edge of the starboard wing.

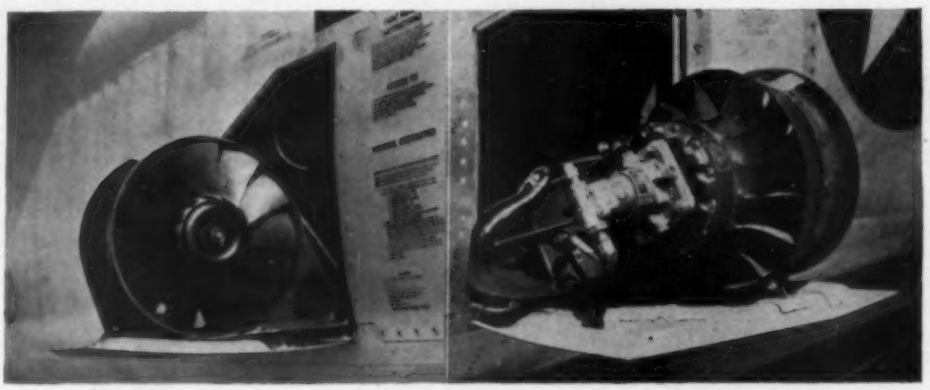
High-speed Windmills

SO many aircraft systems today rely on electric, hydraulic or pneumatic power to drive them that engine failure in a single-engined aircraft, where the main power source cannot be duplicated, must be compensated as well as possible by the provision of accumulators, air bottles and manual operation—generally bulky and often inadequate. Emergency electrical power, for example, is particularly difficult to provide for any length of time if reserve battery capacity is not to become unduly large; and reversion to manual flying-control operation is never likely to be satisfactory on transonic and supersonic aircraft.

For some time past, consideration has been given to the provision of emergency power by a ram-air turbine, which could be lowered into the airstream manually, or by using the residual storage capacity of one of the aircraft systems. Several successful designs have now been completed; examples of English manufacture were displayed at the S.B.A.C. show at Farnborough. In general, the turbine is utilized to drive an hydraulic pump, often in tandem with an alternator or a D.C. generator, and continuous operation of electric and hydraulic services will then, of course, be available.

The ram-air turbine illustrated in the accompanying photographs has been developed and produced by the Marquardt Aircraft Company, in close co-operation with Chance Vought, for use on the F8U-1 Crusader. The rotational speed of the unit is closely controlled at 6,000 r.p.m. by a set of governor vanes set behind the turbine wheel, and the variations in this velocity are sufficiently small to maintain the Gray and Huleguard alternator frequency within the required tolerances. Contained within the alternator casing is an auxiliary direct-current generator and the power package also contains a Vickers hydraulic pump, so that flight control and communications can be maintained down to safe landing speed.

The power package is of the "drop-out" type actuated by a pneumatic trigger which pushes the turbine into the airstream—an extension ram can be seen in the right-hand close-up view below—and the package will function even at supersonic speeds. In the Crusader installation the weight penalty to be paid for the emergency power available is rather less than 50 lb; this does not include the weight of the emergency reservoir and hydraulic system. Although the Crusader has the distinction of being among the first aircraft to have a ram-air turbine installed, there can be little doubt that most other single-engined operational aircraft will follow suit.



The turbine blades (left) of the Marquardt turbine are controlled to rotate at 6,000 r.p.m. to drive the alternator with auxiliary D.C. generator and the hydraulic pump seen on the right. Points to notice are the well-stiffened door and the extension ram mounted in the fuselage bay.

MANUAL OF AIR SURVIVAL

UNDER the title *Aircraft in Distress*, an American, Harley D. Kysor, has written a reference work which covers every type of aircraft emergency from the pilot's point of view. It represents a comprehensive and up-to-date study of the broad field of aircraft assistance and distress operations, as well as first-aid and survival. The book is published by the Chilton Company, Chestnut and 56th Streets, Philadelphia 39, Pennsylvania. Retail price is $6 (£2 2s 10d). Generously illustrated, the work contains chapters dealing with air search and rescue, flying safety, emergencies and evacuation, rescue aircraft interception and emergency landing procedures. In 424 pages Mr. Kysor has assembled what must rank as the most detailed and comprehensive summary of distress procedures yet published; and in its preparation he has been able to draw on the assistance of Government and civil agencies, American and European airlines, private organizations and the American military services.

OSTIV ASSOCIATESHIP

ASSOCIATE individual membership of the Organization Scientifique et Technique Internationale du Vol à Voile (OSTIV) is now available. This new class of membership will receive copies of *OSTIV News* and other publications, together with a discount on future OSTIV publications. The purposes of the Organization are to help to bridge the gap between the pilot and the scientist and engineer, to collect and distribute relevant information, and to bring about a closer contact between pilots and scientists throughout the world. An interesting series of projects is planned for the coming year. Associate membership costs 28s per year, and a year's subscription to *OSTIV News* is 14s: further information from Miss Betsy Woodward, Editor of *OSTIV News*, Department of Meteorology, Imperial College, London, S.W.7.

NEW CREW HELMET

THE U.S. Bureau of Aeronautics has designed a new safety helmet for U.S. Navy aircrew. Its shell is of laminated glass plastic; a visor-type eyeshield slides up and down within its own protective housing and fits closely to the mask when down. Mask and chin-strap fastenings are designed to prevent the headgear being blown off during high-speed escape. The earpads are sound-excluding and the shell is lined with rigid plastic foam material which yields under pressure to cushion shock before it reaches the head. This is claimed to be more effective than the tape cradle system used at present.

The scene in the Assembly Hall, Edinburgh, as the twelfth annual parliament of I.A.T.A., described below, opened on September 17.

CIVIL AVIATION

EDINBURGH ENTERTAINS THE AIRLINES

WE all read and hear a good deal about the "statesmanship" and "international example" of the International Air Transport Association, over whose conferences the flags of 50 nations are unfurled; but it is only first-hand experience of I.A.T.A. at work which really gives such phrases meaning.

Anyone, of course, can agree on a resolution if its terms are suitably vague and non-committal. But deadbeat diplomacy is not for I.A.T.A., even though differences of opinion—political as well as commercial—are often sharp. There is the story of how, at one meeting a year or two ago, the delegates of a particular country withdrew when the representatives of another took their seats (there were bitter feelings between the two countries at the time). Yet, as demanded by I.A.T.A. protocol, the meeting's resolutions were adopted 100 per cent. How did this come about? "Oh," said one of the absconding delegates, "we got together in the bar afterwards."

Of the 67 airlines which attended the twelfth annual conference at Edinburgh last week, the majority were represented by their presidents or chairmen—busy men who could easily have sent their juniors. The fact that they did not do so—and, moreover, that they came with their aides as well—seems remarkable at first, because the actual business of an I.A.T.A. annual conference is mainly the rubber-stamping of the year's behind-the-scenes sub-committee work. But, after taking in a few breaths of the conference's atmosphere, one soon appreciates that the working sessions are not the most important part of the proceedings.

On the Wednesday, when most delegates were cruising around Scotland's lovely Kyles of Bute, an observer remarked that so far as he could make out the conference was "just a jolly." He missed the point. It was, indeed, like the previous eleven I.A.T.A. annual conferences, a good party (Scottish hospitality took good care of that); but it was a party where everyone talked shop. In the lounge of an Edinburgh hotel one might hear a French operations director discussing with the president of an American domestic airline the comparative merits of the Convair and the Douglas medium jets; or a Latin American operator talking to an Australian opposite number about the Vanguard, or about the market price of used DC-6Bs. And in the lavish ballroom-buffet of Hopetoun House (one of Britain's most stately homes, where the four British host-airlines—B.O.A.C., B.E.A., Airwork and Hunting Clan—gave a ball on the Thursday evening), similar discussions went on. Lord Douglas, to whom Mr. Juan Trippe handed over the presidency at the opening session, summed it all up when he said: "To my mind the informal side is more important than the formal business."

With so many airline presidents per square inch, it was not surprising that manufacturers were at Edinburgh in force. Let it not for a moment be thought that the industry is ever a gatecrasher at an airline party. They are out to sell, true; but the airlines want to buy also. The Vickers, Bristol, Lockheed, Fokker and other parties were buoyant (afloat might be more expressive) with good cheer; and to Napier goes the palm for the sort of salesmanship we discussed in our leading editorial on September 14. Every day, from Turnhouse Airport, the Eland-Convair took delegates on a round tour of the Highlands. All told, 130 airline representatives, many of them Convair-operators, were flown on a dozen flights (all, incidentally, spanner-free). It must have cost a good deal, and no doubt the aircraft could ill be spared from its tests; hard facts both, but worth setting aside for the golden goodwill-opportunities of an I.A.T.A. conference. Bristol, as might be expected, had a Britannia at Turnhouse Airport giving demonstration flights; and Vickers had the free publicity of the fully booked 100-minutes B.E.A. Viscount service to London. It was, one felt, a pity that other British firms could not have been more prominent.

The Assembly Hall in George Street was the scene of the business sessions, which followed the pattern typical of countless other post-war international conferences. But the atmosphere was free of dreary political intrusion, and proceedings moved at a pace unknown at international government assemblies. The chairmen of I.A.T.A.'s working committees presented their reports, salient points from which are given at the end of this article.

A number of random impressions of the conference should not pass unrecorded. There was B.O.A.C.'s "just right" idea of displaying foreign flowers and shrubs, flown to Edinburgh from all over the world, in the shops and hotels (a representative of the Corporation's sister airline could not, of course, resist joking that they had been "flown from Kew by B.E.A."). And there was Shell's preview of a fine new film on air transport, which aptly distilled the very essence of the conference (the film will not be distributed until the end of the year). The organization of the meeting was unimpeachable, right down to the smallest detail, for which much of the credit goes to Mr. Robert McKean, B.E.A.'s Scottish manager. Mr. J. R. D. Tata's sparkling and witty proposal of thanks to the hosts at the closing session will be long remembered, and the great and expressive personality of Sir William Hildred, architect and builder of I.A.T.A., was felt as strongly as ever throughout the meeting.

Next year's annual gathering will take place in Spain (probably Madrid), starting on September 16. The 1957 president, proposed and elected at the final session of this year's conference, will be Sr. Tomás Delgado, chairman of Iberia. Looking further ahead, as the airlines are wont to do, it is possible to forecast that the 1958 I.A.T.A. meeting may be held in Tokyo.

To witness I.A.T.A. at work, as did some 400 people at Edinburgh last week, is to form the conviction that air transport is a very real common denominator of the nations.

J. M. R.

Points from the Conference

We summarized in our last issue Sir William Hildred's opening address to the annual general meeting. Other addresses were delivered by the president, Lord Douglas of Kirtleside; by Mr. John Profumo, on behalf of the Minister of Transport and Civil Aviation (Mr. Harold Watkinson, owing to affairs of state, was unable to attend); by Sir John Banks, Lord Provost of Edinburgh; and by Mr. Juan T. Trippe, the retiring president. The actual working sessions during the week were concerned with the reports of the executive committee, and with the reports

(*Continued on page* 566)

The London Airport scene—a view from the terrace of the Queen's Building looking toward the central control tower on the right and the passenger handling building on the left. The cost of the three buildings, now completed, was about three million pounds.

CIVIL AVIATION . . .

A CANADIAN OCCASION

MR. NICHOLAS SCHIPPER (Netherlands) and Mr. Peter Langford (Australia) were elected chairman and vice-chairman of the third I.C.A.O. Air Navigation Conference which opened at the organization's headquarters in Montreal on September 18. During the ensuing four or five weeks the members of the conference—representing more than 20 nations and international organizations—will discuss and attempt to establish international standards for air safety. These will be concerned with the construction and operation of aircraft belonging to member-states and the pilot qualifications which are to be regarded as a minimum for specific routes.

Heading the 15-strong British delegation to the I.C.A.O. conference is G/C. J. B. Veal, C.B.E., A.F.C., Director of Aviation Safety and Licensing at the Ministry of Transport and Civil Aviation. He is well supported by officers from the Air Registration Board, Meteorological Office and from his own Ministry and by advisers from B.O.A.C., the Society of British Aircraft Constructors, the Ministry of Supply and the British Air Line Pilots' Association. The airline pilots by no means confine their opinions and recommendations to the items on the agenda dealing with route qualifications; rather the reverse—the International Federation of Air Line Pilots' Associations reached something of an impasse at the Rome conference and the draft working paper which they have prepared on this subject is known to represent a compromise point of view. Their delegation (which includes representatives of B.A.L.P.A. and the U.S. Air Line Pilots' Association) is, however, pressing for a fundamental revision of Annex 8 (which deals with the airworthiness of aircraft) of the convention on international civil aviation.

Their working paper should be sympathetically received as it is an agreed policy of the Montreal conference to replace the existing airworthiness standards by broad standards covering the basic requirements for air safety which will not be outmoded by aircraft now in the design stage. Since membership of I.C.A.O. implies that certificates of airworthiness granted by a member state will automatically be accepted by every other member whose territory is overflown, the revised standards will be necessarily more general than the detailed—and often ignored—recommendations of the present Annex 8. In opening the conference, I.C.A.O.'s director-general (Mr. Carl Ljunengberg) warned the assembly of the need for quick action to establish new standards by 1959. "In certain areas," he said, "international jet transports may be in general use before that time."

Another problem before the conference is that of "operational control," which covers the "exercise of authority over the initiation, continuation, diversion or termination of a flight." Some of this responsibility is now frequently passed on to a ground controller, who in many cases can view a particular flight from the broader outlook of airline efficiency; and the task the delegates are to undertake will be to clarify the procedures of operational control and to determine its requirements and responsibilities. Opinions differ across the Atlantic as to the degree of responsibility that should be invested in each member of the pilot and despatcher team, and the issue is partly clouded by considerations of R/T. congestion—the suggestion being that R/T. use can be reduced if the despatcher selects relevant information for his pilots from coded ground-to-ground signals and then transmits them by R/T. Not unnaturally, the majority of pilots require assurance that the man on the ground has considerable judgment and, at least as important, receives really adequate information through his ground channels.

Rearward-facing seats (now sufficiently well-tried in military aircraft for conclusions as to their suitability to be drawn) and improved navigation lights (for low-visibility use) are also to be discussed at the air navigation conference. The acceptance of international standard requirements for high-intensity flashing "anti-collision" lights, already in force in the United Kingdom and U.S.A. may also not be far off—aircraft collision is too fresh a memory for any recommendations on suitable standards to be half-hearted. Another warning device is described below.

. . . GOES BOOM WHEN I'M NEAR YOU

IN April last year, the Air Transport Association of America issued to some 600 U.S. electronic equipment manufacturers a specification for a proximity warning indicator. Of the many proposals developed, the warning indicator manufactured by the Collins Radio Company has been deemed the most satisfactory so far, and both American and United Air Lines have announced that they will use this device in their aircraft.

The Collins proximity warning indicator is still undergoing development and an interim stage will be used before the final system is available. In its present form, the indicator consists of a warning horn or "other instrument" to attract the pilot's attention and six lights which will indicate the quarter—in bearing or azimuth—from which a dangerously close aircraft is approaching. In its final and more sophisticated arrangement, the range-speed-direction computers will manipulate warning lights advising the pilot in which direction to turn.

Other manufacturers who submitted proposals are likely to be able to offer equipment for use in the "not-too-distant future," report the Association, who say that they are impressed with the basic development that several companies have accomplished.

LENGTHS AND STRENGTHS AT PRESTWICK

THE uncomfortable problem of the capabilities of many airport runways to cater adequately for the big jets has so far largely tended to be uneasily postponed by authorities competent to sanction extensions. Their attitude is understandable; enormous expense is involved, the aircraft still seem some way from going into production and it cannot be overlooked that there is some reluctance to admit that the aircraft are likely to be used at gross weights approaching 300,000 lb. Nevertheless, the bill for Patria's (concrete) ribbon is going to be presented in many parts of the world within the next few years.

A sudden challenge to Scotland's primary airport, by Mr. Gordon R. McGregor, president and delegation head of T.C.A. at the Edinburgh I.A.T.A. conference, placed Prestwick on the defensive. Mr. McGregor, whose airline is buying DC-8s in 1960, said that they would not be able to land or take-off from Prestwick on any of its present runways—an extension of 3,000ft to bring the length to 10,000ft would be required. "There is no time to waste," he insisted, "four years go quickly in our business . . . We want to serve Scotland and if the T.C.A. service is to be maintained some money will have to be spent."

In this he is ruefully supported by Dr. Christopher Macrae, secretary of the Scottish Council for Development and Industry. "Prestwick must be maintained as a first-class airport," said Dr. Macrae, "and everything possible will be done to achieve it . . . If Prestwick ceased to become [one] it would be like going back 100 years and then discovering that Scotland did not have a first-class seaport."

A reply to Mr. McGregor was given by Sir Patrick Dollan after a meeting of the Scottish Advisory Council for Civil Aviation, of which he is chairman. "If foreign airlines are going to fly bigger machines they should prepare a report and inform the Ministry of Transport and Civil Aviation of their intentions

so that they can be examined," he said. "If runways are to be extended at Prestwick, London and elsewhere, the Government would have to ascertain costs and find out the revenue likely to be obtained. We do not think that any airline has the right to say that they are going to operate this or that machine without notifying the Government of their plans well ahead." The estimated cost of extension is of the order of £1m per mile, an expense which, it was pointed out by Sir Patrick, would have to be reviewed by the Government in regard to both the civil and military services using the airfield.

SAY FAREWELL TO GATWICK

THE recent transfer of Airports, Ltd., the owners of Gatwick and Gravesend airports, to the control of the Hammerson group of companies closes a chapter in the history of the two airports and marks the end of the firm's connection with aviation. Formed as a public company in 1935, Airports, Ltd., developed Gatwick for civil aviation. (British Airways began operations there in 1936 and Lord Swinton officially opened the airport in June of that year.) It was the first airport with direct rail access to London and the station was specially built adjoining the airport for this purpose. With the underground tunnel and mobile passenger gangways, the company pioneered "covered travel" from Victoria Station to the ultimate destination.

From 1937 Gatwick and Gravesend were fully occupied as training centres for the Services and at the outbreak of war in 1939 both airports were requisitioned by the Air Ministry. Gatwick became the subject of considerable publicity when the Government decided to acquire the property and develop it as No. 2 to London Airport. After a public inquiry in March 1954, the Government subsequently acquired from Airports, Ltd., the land and buildings comprising the original airport. The management have always maintained that Gatwick was the ideal site for an airport to serve European traffic and since its acquisition much work has been carried out.

Gravesend Airport was leased to Essex Aero, Ltd., in 1951 with an option to purchase during the period of the tenancy; the option was exercised in July this year, although the Ministry permission for the land to be developed as a building site will be implemented very shortly.

Following an offer to the shareholders in June this year by the Hammerson Property and Investment Co., Ltd., the directors of Airports, Ltd., headed by Lt-Col. F. C. C. Balfour, C.I.E., C.B.E., resigned and the registered office has been transferred from Gatwick to Quadrex House, Park Lane, London, W.1. Mr. S. A. Gordon, the manager, secretary and sole surviving executive of the company since its formation in 1935, has remained at Gatwick but now retires.

Viscounts for Capitol Airlines and the U.S. Steel Corporation now incorporate provision for weather radar. A new design of bulkhead shown above will be used but a dielectric radome will be fitted.

CABOTAGE IN CANADA

SCANDINAVIAN Airlines System who, as reported in *Flight* last week, recently crossed swords with Lufthansa over cabotage rights in Germany, have declared that they will discontinue their refuelling stop at Winnipeg because of the refusal of the Canadian Federal Government to permit them to pick up or unload passengers and freight. Mr. Jobin, the Manitoba Minister of Industry and Commerce, said that this made it impossible for people from the West to use the Scandinavian service to Los Angeles and Europe and thus avoid the round trip *via* Montreal or Vancouver to fly to these destinations. Both he and Mr. George Sharp, the Mayor of Winnipeg, who had also objected to the Government's "discrimination," received a reply from the Federal Transport Minister, Mr. George Marler, to the effect that S.A.S. could not acquire Winnipeg loading and unloading rights unless a Canadian airline wished similar rights in Scandinavian countries; and Department of Transport officials added that no Canadian airline was apparently interested in landing passengers in Norway, Sweden or Denmark.

This was immediately disputed by Trans-Air, Ltd., whose president, Mr. R. D. Turner, said that his company "felt there was room for a profitable Polar route to Scandinavian countries from Winnipeg with plenty of potential business from Western Canada and the Mid-West states in a direct route to Europe." Mr. Turner disclosed that Trans-Air have applied to the Department of Transport for permission to establish another trans-polar route between Winnipeg and the Scandinavian countries or between Winnipeg and the United Kingdom.

BREVITIES

AEROFLOT announce that the second scheduled domestic service with the Tu-104, between Moscow and Bilisi (capital of Georgia), began last week.

* * *

A European congress of aviation medicine will be held at Scheveningen, Holland, from October 30 to November 1.

* * *

Bradshaw have published a new alphabetical quick-reference air guide to Europe.

* * *

A Swissair application for permission to substitute Cologne for Frankfurt as a stopping place on its Zurich-New York run will be heard by the Civil Aeronautical Board on October 10.

* * *

A year before S.A.S. take delivery of their first DC-8 they will receive an electronic flight simulator. Built by Link Aviation, Inc., of New York, the simulator will cost over £300,000.

* * *

Terminal extensions at the Kingsford Smith Airport, Sydney, which will have to handle about 115 civil aircraft in the Olympic Games rush between November 1 and November 20, may not be finished in time.

* * *

S.N.C.A.S.E. have made a tentative agreement with the U.S. Republic Aircraft Corporation to obtain financial assistance with production of the Caravelle. Air France's Caravelles will have autopilots by Lear.

* * *

Schiphol Airport will be enlarged from 700 to 1,350 acres and equipped with tangential runways in the near future. There are plans for a connecting rail link with Amsterdam and a viaduct to lead one of the runways over the Hague-Amsterdam autoroad.

Swissair will operate a daily tourist service in each direction from Zurich to Cologne *via* Stuttgart from October 29.

* * *

A new airfield with a runway 2,900 yd long and 65 yd wide is being built on the Sem Plain, ten miles outside Belgrade.

* * *

Load factors of 97 per cent were recorded by B.W.I.A.'s Viscounts on the New York-Bermuda route during their first three months of operation.

* * *

After discussions with the Channel Islands Air Advisory Council, B.E.A. have agreed that fares to the islands will be increased by only 2½ per cent as against the anticipated 10 per cent increase demanded earlier.

* * *

The names of aviation pioneers from nine countries are to be given to the K.L.M. Viscount 803 fleet. The chosen names are: Sir Sefton Brancker; Louis Blériot; Kingsford Smith; Dædalus; J. C. Ellehammer; Otto Lilienthal; Jan Olieslagers; Leonardo da Vinci; and Wright Brothers.

* * *

Lockheed have received the first "pilot order" from the rent-an-airliner Air Finance Corporation. Lessees will be able to operate economical aircraft without major capital expenditure on new equipment. The Corporation are to buy up to 25 Lockheed transports.

* * *

A modification to increase the zero fuel weight of the DC-6C to improve payload for short-range operations is to be carried out to six of K.L.M.'s fleet by the firm of Aviolanda of Woensdrecht, Holland, early in 1957. The modification, which is to the lower centre section, takes six weeks to incorporate.

EDINBURGH ENTERTAINS (cont. from p. 563)

of the other I.A.T.A. working committees—i.e. the fares, financial, technical, medical, legal and facilitation groups. Salient points and quotations from these reports, as well as from the opening addresses, are as follows.

* * *

"Our association does not control production, allocate markets, or fix prices, which are the prime characteristics of cartels. Governments have complete control of these three basic competitive elements in our industry." (*Trippe*)

* * *

"The governments, in accepting our tariff recommendations, must certainly assume that they will be implemented as written. We would be derelict if we did not see that this was done to the best of human ability." (*Trippe*)

* * *

"I can only reiterate a sincere hope that the year 1957 will show clearly that Aeroflot desires to participate in international civil aviation and in I.A.T.A." (*Trippe*)

* * *

"We are coming to believe that speed . . . is the one quality of air transport which we must constantly seek to improve; that nothing matters so long as we can reduce our schedule times . . . Safety must be a predominating factor, but after that regularity, punctuality, comfort and, above all, cheapness are the other qualities which the air transport industry must develop." (*Lord Douglas*)

* * *

Air mail postal rates were set every five years by national postal administrations in the Congress of the Universal Postal Union, whose next meeting was scheduled for August 1957 at Ottawa. Whilst the airlines could study and discuss air mail rates in I.A.T.A., the Association could not negotiate on their behalf and there was no appeal from U.P.U. decisions. (*Maj. J. Ronald McCrindle, chairman of the executive committee.*)

* * *

"There is a possibility of a three-tier [fares] structure appearing over the North Atlantic. There is already a three-tier structure in the Middle East and this was considerably extended at Cannes. We have barely taken the top off the Polar fare problems . . . Unless we are able to find solutions we may find ourselves so over-complicating the task of our sales offices that though we have the right fares and rates, nobody can explain them to passengers." (*K. G. Granville, chairman of the fares committee.*)

* * *

The airline industry was still struggling with currency controls and fluctuations in some countries, which often made it difficult for them to bring back to their home treasuries the full value of the revenues they earned abroad. (*R. Lorimer Weir, chairman of the financial committee.*)

* * *

An attempt was being made to determine the total value of an airline's commercial indebtedness to another by evaluating only a small percentage of the bulk of the flight coupons which were the airline's record of its interline transactions, rather than by checking every one. (*Weir*)

* * *

"I am happy to report that the air forces of several countries are not only co-operating with us most effectively [on traffic control problems], but also are making the most generous contributions based on their experience with advanced military aircraft that have many features in common with those we intend to fly in a few years' time." (*Capt. A. V. J. Vernieuwe, chairman of the technical committee.*)

* * *

The airlines were looking for solutions to the air traffic control problem in two phases: improvements to present systems which might enable them to handle the maximum load in the next five years; and development of new systems and principles for the demands of the first decade of high-speed jet operations in 1961 to 1970. (*Vernieuwe*)

* * *

Long-range future control requirements were (1) split-second communications between aircraft and controller, possibly through integrated data transfer; (2) an organization of control on an area rather than a route concept; (3) and cockpit instruments to give the pilot a visual interpretation of his place in the control pattern. (*Vernieuwe*)

* * *

It was "unrealistic" to set up control areas on the basis of national boundaries, as in Europe. A proposal had been put forward for the creation in this area, by both civil and military, of a centralized air traffic control authority. (*Vernieuwe*)

* * *

I.A.T.A. had developed a 150-page document of principles for the design of airport buildings and aprons which had been distributed to airport operators and airlines. (*Vernieuwe*)

An unexpected visitor to the I.A.T.A. annual meeting on September 18 was Col. Anton Konstantinov, Soviet air attaché in the United Kingdom. He is seen here with Sir William Hildred (left) and Lord Douglas, this year's president of the world airlines' association.

Typical of I.A.T.A.'s hard-working specialist committees is the financial group, members of which are seen here at the conference. They are (left to right): Mr. F. J. H. Johnston, Dr. H. J. Gorecki, Mr. R. Lorimer Weir, and Mr. A. J. Quin-Harkin.

I.A.T.A. had recommended to I.C.A.O. for adoption as an international standard a new runway lighting system to give the pilot both narrow and broad visual gauge of distance. (*Vernieuwe*)

* * *

I.A.T.A. had recommended to I.C.A.O. that the S.S.B. (single side band) H.F. communication be adopted internationally, and had recommended methods for simplifying messages. (*Vernieuwe*)

* * *

The North Atlantic route was fast becoming saturated with traffic, and no great improvement in control could be expected until navaids and communications of greater range and reliability were devised and installed. (*Vernieuwe*)

* * *

Carriers should have the greatest facilities to make interchange arrangements or charters between airlines with or without crews, and in both instances for long or short periods. (*Mr. W. A. Steanstra-Toussaint, chairman of the legal committee.*)

* * *

A new agreement on cargo claims had been completed, on the principle that one airline could settle a claim on behalf of another. (*Steanstra-Toussaint*)

* * *

"The facilitation and advisory group hopes that the meeting will agree that it is essential to reduce inbound and outbound ground formalities to a total of one hour. Only by doing so will these formalities bear a reasonable relation to the speed of the aircraft which will be operating. Even then, ground time will represent 14 per cent of the total time it takes to make the trans-atlantic crossing. (*J. A. Paine, chairman of the facilitation advisory group.*)

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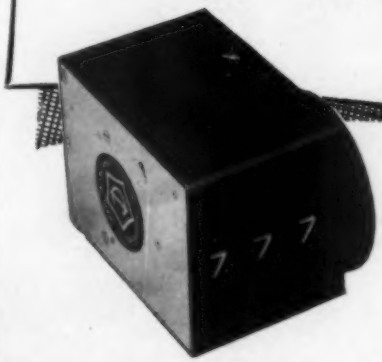

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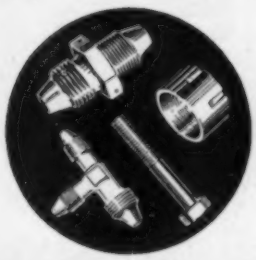

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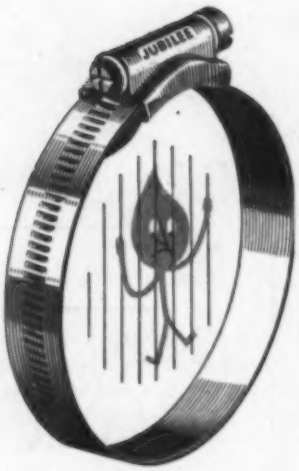

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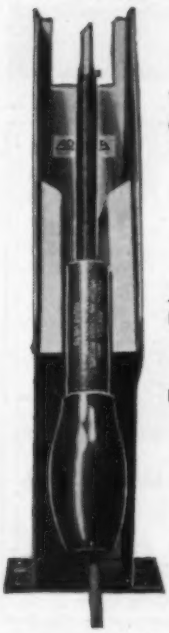

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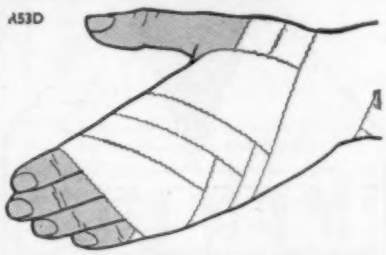

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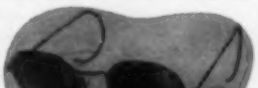

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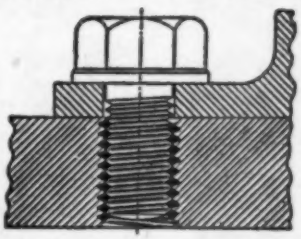

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THE AIR TRANSPORT ADVISORY COUNCIL give notice that they have received the undermentioned applications to operate scheduled air services:—

APPLICATION No. 953. From Eagle Aviation, Ltd., of Marble Arch House, 40, Edgware Road, London, W.2, for a Seasonal Normal Scheduled Service with Dakota aircraft for the carriage of passengers, supplementary freight and mail between Manchester (Ringway) and Ostend at a frequency in accordance with traffic demand during the season from April to October inclusive each year, for a period of 10 years, commencing from date of approval.

APPLICATION No. 957. From Cambrian Airways, Ltd., of Cardiff (Rhoose) Airport, Near Barry, Glam., for a Normal Scheduled Service with Dakota and D.H. Heron aircraft for the carriage of passengers, supplementary freight and mail between Cardiff (Rhoose) and Dublin (Collinstown) at an initial frequency of one service daily increasing further according to traffic demand during the period from April 1, 1957, to March 31, 1967.

APPLICATION No. 958. From B.K.S. Air Transport, Ltd., of 1, Marylebone High Street, London, W.1, for a Normal Scheduled Service with Dakota and/or Viking aircraft for the carriage of passengers, supplementary freight and mail between Newcastle (Woolsington) and Dublin (Collinstown) at an initial frequency of from three to seven services weekly and later increasing to 14 flights per week for a period of seven years from date of approval.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3, Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [5751

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Please send brief particulars (quoting ref. F/72) to the **Personnel Officer, Saunders-Roe Limited, East Cowes, I.o.W.**

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WANTED. Works Manager. Preferably licensed. Electrical ancillary overhaul workshops. Full details. House available. Surrey. Box 2113. [0976

WANTED. Licensed Chief Inspector. Experienced Dakota and ancillaries. House available. Surrey. Box 2114. [0977

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APPLY giving full details of experience and qualifications to Assistant Staff Manager (Appointments), B.O.A.C., London Airport. [5745

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BRISTOW HELICOPTERS, LIMITED, have vacancies for engineers licensed on S.51 and S.55 helicopters. Permanent employment offered at home and abroad. Applications will be considered from those holding a "C" Licence on Alvis Leonides engines.

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APPLICATIONS to: Henstridge Aerodrome, nr. Templecombe, Somerset. [5747

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DRAGON AIRWAYS require 'A' and 'C' licensed engineers preferably with Heron and/or Viking endorsements. Apply in writing to the General Manager, Dragon Airways, Ltd., Woolsington Airport, Newcastle-upon-Tyne, 3. [5759

LIAISON Engineer (Senior) required by a large and expanding engineering company situated in the London area. Applicants will have a wide knowledge of aircraft design and be thoroughly conversant with the aircraft industry. The selected candidate will be mobile and possess his own car and will be required to visit aircraft manufacturers' premises. Salary up to £1,200 per annum. Please reply giving full details to the Employment Manager, The Plessey Co., Ltd., Vicarage Lane, Ilford, Essex. [5749

CHIEF Inspector required for aircraft accessory firm West of London. Considerable previous experience essential in light precision engineering, preferably with aircraft background. Applicant must be accustomed to responsibility and control of labour—a strong, outstanding personality and disciplinarian possessing tact and initiative. Attractive salary for right person. Write giving full particulars, training and experience—for the personal attention of Managing Director. Box No. 4276. [5733

SUPERINTENDENT Experimental Department required by Company West of London engaged in development and manufacture of aircraft fuel system accessories. Applications invited from engineers with good qualifications and experience in light precision engineering. Initiative and ability to co-ordinate departmental work is essential. Previous experience of aircraft fuel systems and/or accessories an advantage. Attractive salary is offered. Apply in first instance giving full particulars of qualifications and experience to Chief Designer. Box No. 4275. [5732

ARMSTRONG SIDDELEY MOTORS require a first class Mechanical Designer, aged 26/32, for their Project Design office. Applicants must be works trained designers with at least Higher National Certificate and a sound background experience of aero engine design. The position offered is one of great interest and is an exceptional opportunity for a young engine designer to expand his experience in the gas turbine industry. Applications with full details and in strictest confidence to the Chief Engineer, Armstrong Siddeley Motors, Ltd., Coventry, quoting reference PD/MD. [0474

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***The Supermarine Works of**
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have vacancies in the Instrumentation Section of their Design Office for
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**Write in first instance giving full particulars to:—*

PERSONNEL MANAGER, HURSLEY PARK, Nr. WINCHESTER, HANTS.

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SITUATIONS WANTED

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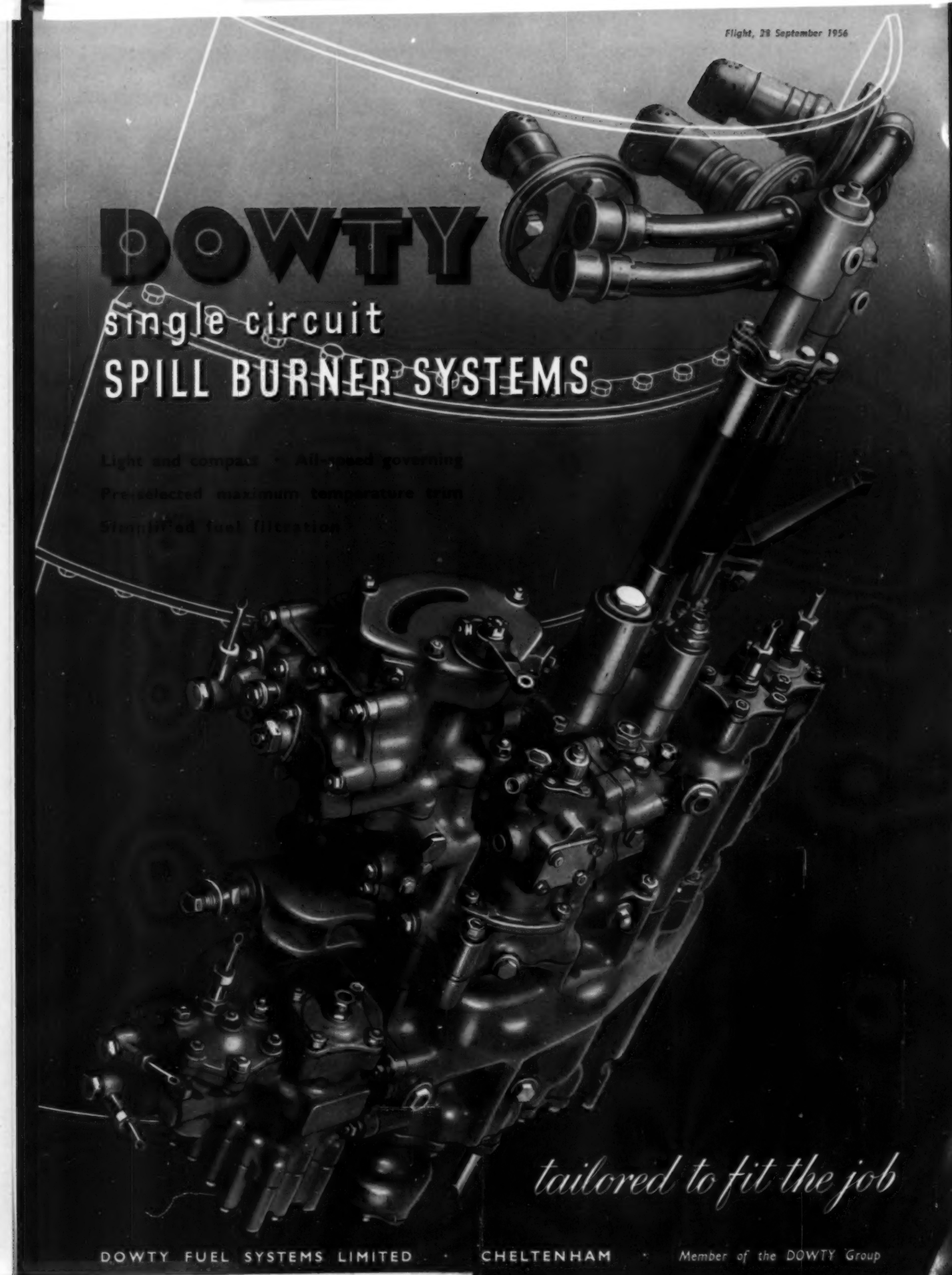
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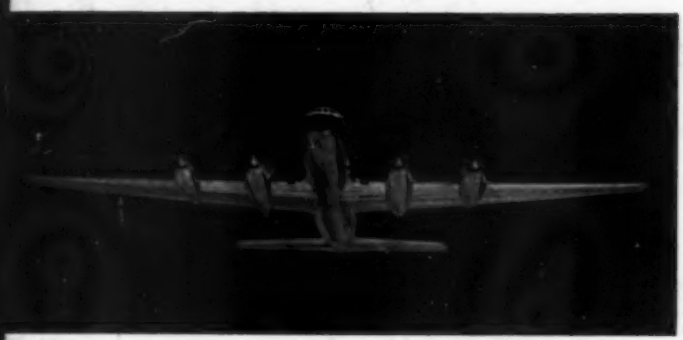

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